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FOR THE

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SEPTEMBER, 1859.

CIVIL ENGINEERING.

Improvements in the Hanging and Arranging of Cylindrical, Conical, or Spiral Steel Railroad Springs for Railway Carriages,—being a Communication.—Patented by WILLIAM EDWARD NEWTON, London, October 19th, 1858.*

This invention consists in arranging cylindrical, conical, or spiral steel railroad carriage springs in groups or series of four or more springs, placed in double lines vertically, so as to possess the length of elastic action which two series of the springs would have if placed the one above the other, while the space which they occupy vertically is very much less than they would require if the springs were placed in pairs, one above the other.

Figure 1 shows, in side elevation, a group of four springs, with the stirrup or suspension-bracket by which they are suspended, and the top plates or caps in which they are set; and figure 2 shows, in side elevation, the manner of arranging and hanging the springs, in series or lines, between the forward and after pedestals of the truck of the car.

The springs represented are Gardiner's conically coiled steel springs, having an open central space or vertical axis; and the suspension-brackets or bars are adapted particularly to their use, but will answer for any other cylindrical spring.

In fig. 1, *s*, *s'*, are the two lower springs, placed small end downwards, and side by side, their upper edges being parallel with each other. Upon the upper edge or periphery of the spring *s*, is placed

* From Newton's London Journal, July, 1859.

the suspension-bracket *b*, having its cup or cap to fit the head of the spring; it extends downwards by the side of the spring *s*, to *b'*,—that is to say, about three-fourths the length of the spring *s*,—when it is bent at right angles, and is continued in a horizontal direction *b''*, (the length of the largest diameter of the spring,) to form a base for suspending the spring *c;* the bracket then turns vertically upwards, as at *b'''*, until it reaches the top of the spring *s'*, when it again becomes horizontal, so as to cover with its cap the head of the spring *s'*. After covering the head of the spring *s'*, it is again bent downward to a point parallel with *b''*, when it is again bent in a horizontal direction, to form a base for sustaining the spring *c'*, as shown by the dotted lines, which indicate the continuation of the spring *c'*; the bracket *b*, *b'*, *b''*, *b'''*, is then turned upwards, and becomes again connected with *b*, at the cup or cap of the spring *s*. The two pairs of springs thus arranged stand each in the angle made by the other, so that their caps are diagonal, and at right angles to each other. The two lower springs *s*, *s'*, are carried by a plate *a*, on the lower beam, and in order to hold them securely in place, they stand on conical studs or short vertical pins. The lower horizontal part of the bracket at *b''*, should just be so far above the supporting bar *a*, as to allow the springs *s*, *s'*, full play, that is, to shut down upon the spiral coils; and at the same time, the cap of the two springs *c*, *c'*, should be so far above the plate that crowns the springs *s*, *s'*, as to allow in like manner the spirals of *c*, *c'*, to shut down upon

Fig. 1.

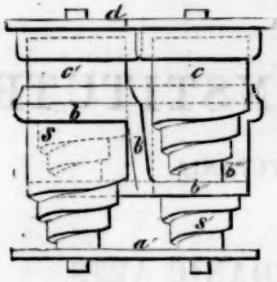
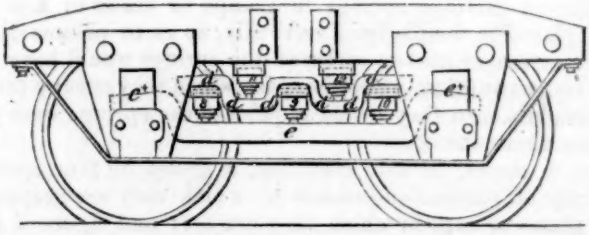


Fig. 2.



each other, so that, by this means, the whole length of elastic leverage of the two springs *c*, *s*, is attained, while the vertical space which they would occupy if placed one directly over the other, is reduced about three-quarters of the height of one of the springs. As a guard or shield to the springs, a thin iron disc of boiler plate iron is placed upon the head of each spring, between which disc and the under surface of the crowning cap is placed thick felting; the cap is flanched to receive the head of the spring and disc upon it, as into an inverted cup, by which means the springs are held in place at the crowns or top; the upper crown plate is firmly secured to the proper appendage under the car, for swinging the car upon the springs.

Another mode of carrying out the same principle of double tiers of springs within a greatly reduced vertical space, is by placing four or more springs in a series or line upon two grouping lever bars, one above the other, between the pedestals and the ends of the bars, having their bearings in the pedestals, as shown at fig. 2, in position under the car at *d* and *e*. The lower lever bar *e*, is horizontal and straight, except at the ends, where it is bent obliquely upwards, and again horizontally, so as to enter the pedestals at each end, and rest upon the top plate of the journal box, as at *e**, *e**. It is secured in its place by being let into a recess, or by a projection upon its under side, and a corresponding recess in the pedestal to receive the projection. Upon the upper surface of the bar *e*, are three vertical conical studs, upon and over which studs are placed the springs 8, 9, 10, in a straight line, and under the side timbers of the truck of the car; this bar *e*, should be a little thicker at the bent parts, to give it strength, as shown. Directly above the bar *e*, is hung the other lever bar *d*, bent alternately up and down; its upper parts resting upon the caps of the springs 8, 9, 10, and its lower parts forming a support for the two upper springs, 11 and 12, of the group which are placed over vertical conical studs on the bar. The crowns or caps of the upper springs 11, 12, face the under surface of the side timber of the truck or car, upon cup castings and discs, which rest upon the springs on either side. The last-mentioned bar *d*, has its ends jut within the arms of the pedestals, where it is held so as to have no lateral motion, and so as to permit the required play within the pedestal up and down; the ends of the bar being spread to very nearly the space between the arms of the pedestal, to avoid lateral motion.

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*On the Relative Values of Coke and Coal in Locomotive Engines.**

By BENJAMIN FOTHERGILL.

(Continued from page 95.)

There yet remains the question of the durability of the fire-boxes and tubes when coal is used instead of coke, and I do not think that I could offer a better proof of the superiority of coal over coke in this respect also, than by quoting a portion of a report which I made on this important subject on the 26th of May, 1858, to the Locomotive Superintendent of the Manchester, Sheffield, and Lincolnshire Railway. The engines there referred to were built in accordance with Mr. Beattie's patent for burning coal and coke:—

"With respect to the durability of the tubes and fire-boxes, when coal is used instead of coke, I consider that question to be settled beyond dispute in favor of the former, inasmuch as it no longer remains a matter of opinion merely, but the result of continuous working with coal and coke demonstrates beyond all doubt that not only is coal superior to coke in respect to heating power, and consequently decidedly

* From the Jour. of the Society of Arts, No. 339.

more economical, but it is less injurious to both the tubes and fire-boxes of locomotive engines; as a proof of this I beg to append a copy of a tabular statement which I had the honor of laying before the directors of the London and South Western Railway in the month of March, 1856, showing the average duration of a set of tubes in their locomotive engines when coke alone was used. At that time as well as in the latter part of 1855, after I had made a series of experiments with coke and coal, I came to the conclusion that the tubes and fire-boxes would sustain less injury by the use of coal than coke, and although one of their coal engines had then run but 51,300 miles and no really appreciable depreciation had taken place in either fire-box or tubes, I saw sufficient to warrant me in concluding that the life of a set of tubes, as well as that of the fire-box, would be considerably prolonged by the use of coal instead of coke. Time has proved that the opinion I then formed was a correct one, inasmuch as I have, up to the present moment, carefully watched the effects produced on the fire-boxes and tubes of the locomotive engines on the London and South-Western Railway; and taking two of their engines which I have examined, where even part coke and part coal have been used up to the commencement of the present month, you will perceive the amazing difference in favor of coal when you compare the results with the tabulated statement copied from my printed Report, dated March 25th, 1856.

Miles Run by the Undermentioned Coke Engines, with One Set of Tubes, on the London and South Western Railway.

Working Pressure of Steam.	Name of Engine.	Miles run.
100 pounds,	Volcano,	118,978
100 "	Stromboli,	127,855
100 "	Vulcan,	128,947
100 "	Milo,	104,627
100 "	Etna,	105,985
90 "	Ruby,	101,905
90 "	Serpent,	92,048
80 "	Medusa,	106,590
100 "	Windsor,	99,907
100 "	Mercury,	73,100
80 "	Fire King,	102,258
80 "	Mazeppa,	89,059
100 "	Sussex,	99,624
100 "	Mars,	103,257
100 "	Comet,	97,201
80 "	Hawk,	74,955
80 "	Acheron,	87,759
100 "	Test,	76,182
100 "	Stour,	69,688
100 "	Rocklia,	86,469
100 "	Avon,	78,785
100 "	Trent,	65,634
100 "	Frome,	83,108

Average duration of tubes, 94,518 miles.

"From the above table you will perceive the average duration of a set of tubes was 94,518, whilst in the two engines I have referred to,

where coal and coke have been used, one of them has run 154,955 miles, and is now carrying 120 pounds pressure of steam, none of the tubes having failed, and they are still in good working condition, and I am unable to say how much longer they will last. The other engine has run 137,676 miles, and I have had two of her tubes sent to my office in Queen's Chambers, Manchester, which you can see at any time.

"I personally paid a visit to the works at Nine Elms and examined these engines; and, bear in mind, that although a portion of the fuel used in these engines is coke, yet the tubes I now refer to have only worn to the extent of three wire gauges in thickness; they were ordered and made to No. 13 wire gauge, and are now No. 16 wire gauge.

"No doubt exists in my mind that the principal portion of this amount of reduction in thickness is attributable to the cutting action of the coke, and not to the effect of any deterioration produced by the action of the coal. With regard to the effect on the fire-box of the latter engine, the back, sides, and crown, are $\frac{1}{32}$ of an inch less than their original thickness, namely, $\frac{1}{2}$ an inch; the tube-plate has been reduced $\frac{1}{16}$ of an inch, the original thickness being $\frac{3}{4}$ of an inch. From these facts you will be able to draw your own conclusions—they speak for themselves—for in one case, where coke alone was used, you have an average (taken from the Company's books) of 94,518 miles as the life of a set of tubes, whilst in the other, where coke and coal are used on the same railway, and working similar trains, you have 154,955 miles run in the one case, and 137,676 miles in the other, and the tubes still in good working condition.

"I have given you these facts as a sample of the results when coke and coal are used, because the fuel you are using in your engines is of a similar character; but I am prepared to prove that were your engines constructed to burn coal alone, the fire-boxes and tubes would be protected from the cutting action of the coke, and greater durability, much beyond the mileage I have reported for coke and coal, would be the result. I am not ignorant respecting the argument that some persons have advanced as to coal containing a greater amount of sulphur than coke; this is a fallacy which I have had proved beyond doubt, and therefore I hesitate not to give you a strong opinion in favor of coal, for instead of its proving destructive to fire-boxes, tubes, or smoke-boxes, the result of my observations and experiments proves the contrary."

In further confirmation of the increased durability of the tubes, I beg to state that the mileage of another engine of the same class as the two referred to, and burning a mixture of coke and coal, amounts to 181,589 miles, and the tubes are still in good condition, and working at a pressure of 120 pounds to the square inch.

In conclusion I beg to remark, that previously to the year 1853, several attempts had been made by different individuals to introduce coal as a substitute for coke in locomotive engines, but from various causes they did not persevere in developing its true commercial value, and I would take this opportunity of stating that the credit of this

important saving in railway expenditure is due to the skill and persevering industry of Mr. Joseph Beattie.

Summary of Experimental Trips made on the London and South Western Railway.

DATE.	Name of Engine.	Description.	Average time in hours and minutes.	Average speed in miles per hour.	Average feet consumed in pounds per mile.	Coal reduced to its coke value.	Quantity of water evaporated per mile in lbs. for 1 lb of fuel.	Highest temperature of water in tender during each trip.	Load in number of carriages.	Weight of train including engine and tender. Tons.	Cwt.	REMARKS.
1855.												
Nov. 15,	Ironsides,	Coal,	2·31	31·25	16·71	11·14	8·29	124°	12·2			Beautiful, clear, frosty day and calm.
" 16,	"	"	2·31	30·68	17·24	11·49	6·72	158°	10·6			Damp foggy day, rails greasy for fifty miles.
" 17,	"	"	2·39	29·71	19·02	12·68	7·07	164°	12·1			Clear day, with strong side wind in favor of down, and against up journey.
" 19,	Vesuvius,	Coke,	2·36	30·27	20·62		7·15	76°	12·1			Wet drizzling rain, with light wind on our back.
" 20,	"	"	2·26	35·23	20·62		7·78	74°	12·2			Rails rather greasy; wind against down journey.
" 22,	Frome,	"	2·27	32·14	20·97		7·62	94°	13·3			" "
" 23,	Canute,	Coal,	2·11	36·76	16·71	11·14	7·35	166°	9·3			Fine clear day, with light wind in favor of down journey.
" 30,	"	"	2·49	27·65	20·51	13·67	8·26	142°	19·0	170	8	Fine frosty day; rails greasy for first 50 miles.
" 30,	Vesuvius,	Coke,	2·56	26·54	23·82		8·21	54°	19·0	167	12	This was the first trip with equal loads.
Dec. 1,	Canute,	Coal,	2·39	29·16	20·22	13·48	8·07	180°	19·0	170	8	Great difficulty in starting. Rails slippery
" 1,	Vesuvius,	Coke,	2·47	27·92	24·92		7·78	54°	19·0	167	12	in consequence of frost and damp fog; wind rather stiff against us.
" 19,	Canute,	Coal,	2·55	26·92	29·80	19·86	9·05		28·0	235	13	Frosty, with strong head wind against us.
" 19,	Vesuvius,	Coke,	3·09	24·71	30·16		7·13	36°	22·0	189	6	Water pipe in Canute gave way. Shut off heating apparatus.

Discussion.—The Secretary read the following communication, received from

Mr. D. K. CLARKE, who says—I perfectly agree with Mr. Fothergill in assigning to Mr. Beattie the honorable position of pioneer in the successful practical introduction of coal as a substitute for coke in locomotive engines, as there can be no question that, by his persevering efforts, he first succeeded in fairly arousing public attention to the real magnitude and importance of the economy in working expenses in railways that might be effected by the general use of coal as fuel. I believe that from this source of economy alone an addition of nearly 1 per cent. may be made to the dividends on the original share capital of railways, taking one with the other, with the reduced tear and wear of locomotives so ably pointed out by Mr. Fothergill. I think, however, that the mode adopted in the paper, of illustrating the saving in cost effected by the substitution of coal for coke is open to criticism, and does not place the question on its proper basis. It is true that the quantity of coke manufactured from a given weight of coal weighs only two-thirds of the orignal coal so consumed, and that 1½ tons of coking coal make only 1 ton of coke. But in seeking to establish this ratio of 3 to 2 as the measure of saving, that is, that the cost of fuel is reduced one-third in dispensing with the coking process, it is overlooked that coking coal, as coal, is not the proper fuel for locomotives, and that therefore the calculation of saving should be based, not upon the relative quantities of coking coal and of coke made from it, but upon the relative prices and efficiency of proper locomotive coal and coke. This ratio is necessarily very variable, as it is affected by cost of transport and other elements. For instance, on one metropolitan line, whilst coking coal costs 12s. 6d. per ton, and the coke made from it costs 18s. 6d., other coal, suitable for locomotive uses, costs as much as 15s. per ton. On another line, whilst the cost of coke is 23s. per ton, the coal suited for locomotives costs 20s. per ton, or only 13 per cent. less. Again, take the North Eastern Railway at Newcastle, the difference of the cost of coke at from 8s. to 11s., and locomotive coal, at 7s. per ton, is so inconsiderable as to scarcely make it worth while to use coal on that line. Notwithstanding such local approximations in cost, there can be no doubt of the economical importance of the question before the meeting. Again, in the comparison of the coal-burning engines with the coke-burning engines of the South Western Railway no allowance has been made for the benefit of heating the feed-water in the former, as against the use of cold water in the latter; whereas my own experience with Mr. Beattie's engine, the Canute, showed a most material increase in the consumption of coal when the feed-water was not heated. The following were the results I obtained from the engine with hot and cold water respectively:—

	Average train.	Coal consumed per mile.	Temperature of feed-water.
With heated water,	11 carriages,	17·4 lbs.	191 deg.
With cold water,	11 "	24·0 "	56 "

Showing an increase of 6·6 lbs. of coal per mile, by using the feed-water cold, as was done in the coke-burning trials recorded by Mr. Fothergill. The coke value would therefore be 16 lbs. per mile, and

not 11 or 12 lbs., as assumed in the paper, for comparison with the coke-burning engines. The large extra consumption of coal, by shutting off the heating apparatus, is no doubt greater in proportion than would be deducible from the known constituent heat of steam and water; but it is caused also by the less favorable working conditions of the engine involved in the use of cold water. I hope on another occasion, to bring the results of my own practice in coal-burning without smoke before the Society.

The CHAIRMAN said the paper they had heard was a very interesting one, and reduced itself to this:—Mr. Fothergill proposed to establish that which appeared to be a very simple proposition, namely, that the whole was greater than its part; in other words, that coal which contained all the elements of combustion and locomotive power was more effectual than the same coal when deprived of some of its elements and converted into coke. It was a most important subject, not only to railway companies, but also to the public at large, who must derive great advantages from the enormous saving in the expenditure for fuel, which Mr. Fothergill had pointed out, and his arguments appeared to have great plausibility. He (the Chairman) would now be happy to hear the opinions of gentlemen present, whom he knew to be well acquainted with the subject.

Mr. GRANTHAM had listened with great pleasure to Mr. Fothergill's paper, as treating of a subject of very great importance, not only in a scientific point of view, but also as affecting the dividends upon railway property. He must confess that his friend's paper had a little disappointed him upon one or two points, and if it should be agreed that some matters of importance had been omitted, he would call upon the Society to award a gentle punishment to Mr. Fothergill, by asking him to read a further paper upon the same subject. He would, in the first place, call Mr. Fothergill's attention to what he considered an important omission in his paper, he not having stated whether he employed the hot water apparatus in the coke-burning engines, as well as in those burning coal. Perhaps Mr. Fothergill would be good enough to enlighten them upon that subject. He would also ask him whether he had considered the question of the blast in the coke and coal-burning engines, as he was of opinion that a much greater heat would be found in the smoke-boxes of the latter than of the former, and less blast would therefore be required. That was an important point. Mr. Fothergill had stated that the wear and tear of the tubes of the boiler was very much less in the coal than in the coke-burning engines. That fully corresponded with his own experience; but there was another element to be considered, viz:, the first cost of this particular description of engine. There might be a question whether the first cost of the engine, which appeared to be an expensive one, did more than make up for the difference in the wear and tear under the two systems. He did not say this with a view to depreciate the statements made in the paper, for he was an ardent admirer of the use of coal in locomotives. There was also another very important question —viz: the heat of the gases in the smoke-box. He was afraid that railway engineers had overlooked this too much, and he feared also

that those who had made experiments upon the subject had made some mistakes. He had lately taken pains to make inquiries of some of the leading engineers as to the heat in the smoke-boxes of locomotives, and the answer he got generally was, that experiments had been tried, and that the temperature had been reduced as low as 300 deg. of heat; others had informed him that it was about 400 deg. of heat in the smoke-box. A curious experiment had been tried in his own neighborhood, where a thermometer had been let down into the smoke-box, the bulb of the mercury going into the box for some distance, and the scale being in sight of the engineer. When the engine was standing at the station the thermomter recorded 300 deg., but it had no sooner started than the thermometer fell to 150 deg. This gave rise to some speculation as to the cause of this wonderful phenomenon, and many theories would, perhaps, have been founded upon it; but the whole was easily explained by the fact that round the thermometer there was a space, so that when the engine was put in motion, and the blast came into operation, the cold air struck upon the bulb of the thermometer, and lowered the temperature of the mercury. He believed the temperature of the fire-box would be much affected by the use of coal, and he was sorry that Mr. Fothergill had not brought that subject forward as an element in his experiments. Within the last few weeks he had been called upon to try some experiments upon locomotive engines in connexion with a subject which he was happy to see illustrated by some specimens upon the table that evening, which he hoped would come before the Society at a future time in a more connected form. Referring to these specimens of spiral heat-diffusers, Mr. Grantham went on to explain that the glass tubes shown, represented the tubes of a boiler, and contained a spiral bar of metal. This was the invention in the first instance of Mr. Duncan, a gentleman of considerable scientific attainments, who took out a special patent for it. Their mutual friend, Mr. Charles Wye Williams, whose name was honorably known to the Society, without being aware of these experiments, was making others in the most accurate manner of his own upon the same subject, and on an extensive scale. Mr. Wye Williams' apparatus was also the subject of a patent; and as these patents clashed with each other, and there were points in each which the other party thought desirable to be retained, they amalgamated their interest, and the invention was now known under the designation of Duncan, Gwynne and C. Wye Williams' heat-diffusers. Mr. Grantham proceeded to detail the results of experiments made with the heat-diffusers as recorded by Gauntlett's pyrometer. The diffusers were placed in the tubes of the boiler, and he knew from experiment that they reduced the heat in the smoke-box prodigiously, probably 200 or 400 deg. The indication of the pyrometer with the heat-diffusers was 800 deg. in the smoke-box, and he believed it would have risen to 1000 or 1200 deg. if the heat-diffusers had not been in use. He had every reason to suppose that if coke had been used in the engine instead of coal, the heat in the smoke-box would have been less. If, therefore, Mr. Beattie's or any other coal-burning engine had this enormous temperature in the smoke-box, it was evident that there was room for improve-

ment in that respect, and it was another item in favor of coal if these deductions were correct. He would state in passing that the heat-diffusers above alluded to, promised very good results, the first trials showing nearly 20 per cent. of gain, and one of the practical difficulties in using them, viz: the supposed tendency in the tubes to become closed with ashes, had not taken place. Looking at the title of the paper, he regretted that Mr. Fothergill had confined his observations to one system only, as he was aware that he had an abundant store of information upon the burning of coal under other circumstances. He did not say this to detract in any way from the merits of Mr. Beattie's improvements. That gentleman had courageously faced the question, and was the first to direct public attention to it. He (Mr. Grantham) had, however, great hopes that some simpler means than those introduced by Mr. Beattie would be adopted. For a great many years he (Mr. Grantham) had attended the experiments of Mr. Wye Williams, and had been a party to most of the investigations made by that gentleman upon the combustion of coal, and from the experience thus derived he was of opinion that the operations so necessary in this matter would be carried on by a simpler engine than that of Mr. Beattie—combining, it might be, many of his contrivances, but doing away with a great deal that was complex.

(To be Continued.)

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*On the Co-efficients of Elasticity and Rupture in Wrought Iron, in relation to the volume of the metallic mass, its metallurgic treatment, and the axial direction of its constituent crystals.** By R. MALLET, M. Inst. C. E.

(Continued from Vol. xxxvii, page 397.)

Discussion.—It was explained that Tredgold and other experimenters only gave the absolute forces which would tear a bar asunder. In the present investigation an endeavor had been made to ascertain the amount of permanent elasticity possessed by the metal, as well as the point at which it would become actually ruptured.

It was contended that the drawings exhibited gave a very imperfect representation of the piling of the iron for large forgings, and that hence the author had been led to draw erroneous conclusions. With regard to the manufacture of the two monster mortars, 36 inches in diameter, and capable of throwing a ball weighing about 30 cwt., it was remarked that their merits as forgings were extraordinary. At first, owing to large rents in the centre of the core, the forgings were failures, but after a little experience had been gained, the second forgings were quite successful. In the manufacture of these monster guns they were built up in seven distinct layers, the forging occupying seven weeks. So far from any deterioration or crystallization taking place, the metal was improved by its long-continued heating and working; and the metal in the heart of the gun was found to be of greater strength than the bar iron of which it was composed, being perfectly homogeneous, strong, and tough. A series of experiments for testing

* From the London Civ. Eng. and Arch. Jour., April, 1859.

the correctness of the process showed that the ordinary manufacture of bar iron, by working and re-working several times, had its limits. As a proof that the deductions in the Paper were incorrect, it was asserted that engineers had one universal rule for the manufacture of forgings, whether large or small, and it was not found that the shafts of 1000 H. P. engines were more liable to fracture than those of 100 H. P. This was practical evidence that the metal was not more deteriorated in large forgings than in small from the length of time it was exposed to the action of the fire; indeed no one portion was so exposed for any great length of time. It was urged that scrap iron, or any other highly refined iron, was the worst material for the construction of large forgings. It was considered that a strong, fibrous, fresh-puddled iron was superior in every respect, as the ordinary workings required in the process of forging would be sufficient to improve it to the average maximum of strength; whereas, a highly refined iron had already reached the highest point as regarded strength, so that it was more likely to be injured by additional working. There was another reason why scrap iron should not be used for the manufacture of forgings. Scrap iron was composed of many different qualities of iron, all having their own special welding points. When worked together, one portion which was less refined was too much heated, and consequently deteriorated before the more highly refined portions were at a welding heat; so that there was the difficulty either of burning the one, or of being unable to weld the other. Again, the specimens selected by the author for trial, and which he said were weaker than the original iron composing the forging, were not taken off in the direction in which the fibre was laid for strength—in which it was intended that the strain should be borne. Now, forge masters always laid the grain of the metal in the direction in which the strain would ultimately be applied; whereas the samples experimented upon, had been cut transversely to that direction.

With regard to the new material, "puddled steel," it was believed that it was destined to work a complete revolution in almost all matters in which iron had hitherto been used. It had been proved to possess at least double the tensile strength of the best wrought iron, and the elastic limit of the material was also greater in proportion to the breaking strain. A piece of this material had been subjected to a strain of 32 tons per square inch for seventeen consecutive hours without exhibiting the slightest appearance of elongation. Subsequently, a bar 4 feet in length and 1 inch by $\frac{3}{10}$ths inch in section, had been exposed to a strain of 45 tons per square inch, when it was found that an elongation of $\frac{5}{10}$ths of an inch had taken place. Upon the weight being removed $\frac{1}{2}\frac{3}{0}$ths of this elongation were recovered, showing that the elasticity of the material had not been destroyed. On another occasion the elongation amounted to $\frac{24}{100}$ths of an inch, and returned to $\frac{20}{100}$ths of an inch. Upon a second application of a strain of 56 tons per square inch the bar was broken, the elongation having been $\frac{37}{100}$ths of an inch. In other experiments the bars broke at 55, 56, and 60 tons, and one bore the enormous strain of 87 tons per square inch. To attain this favorable result, which it was believed might eventually

be accomplished as a rule, it was essential that great care should be taken in the selection of the materials, and great pains in the manufacture. It was entirely a question of good workmanship and good machinery; and a new manufacture of this sort would, for years to come, require the utmost attention and solicitude. In Germany, where this great improvement in metallurgy had been first introduced, a large number of manufacturers commenced making puddled steel; the consequence had been that an amount of bad material had been thrown upon the market, which had brought puddled steel into disrepute for a time, and from which it had scarcely yet recovered. This was to be feared in this country when the German patent had expired.

It was further contended, that if the calculations in the paper had been based upon forgings faggotted in the manner delineated in the drawings, they were of little practical utility. It was stated that large forgings weighing 20 tons, and measuring 24 inches in diameter, for engines of 1000 H. P., were now made at several places in England, without flaw or defect, except perhaps a small sand speck upon the surface, which was not of any consequence. When Nasmyth's hammer was first introduced, the plan was suggested of having the lower forge block made of a V shape, and the bottom part of the hammer so small as to strike only upon the upper centre of the periphery of the forged piece. The mass was thus struck in three places, and the tendency was to force the material to the centre, so as in fact to render the heart as solid and homogeneous as the other portions.

In reply to an inquiry as to whether the rents in large iron forgings, spoken of in the paper, would not also be liable to occur equally in the puddled steel, it was said, that in forgings of iron large crystals or grains were developed, which would not be the case in similar masses of puddled steel; and that in the latter the aggregation of grains or crystals was not increased by the agglomeration of the mass. These rents might be accounted for by the differential contraction of the metal. In the principal case referred to, the outside of the collar, which was 4 feet in diameter, cooled more quickly than the remainder of the forging, and these internal rents took place after it had left the hammerman's hand. It was stated that plates of puddled steel had already been supplied from the Mersey works for twenty-one vessels, some of them 250 tons burthen and 38 feet beam. The thickness of the plates for the vessels for Indian river navigation was one-eighth of an inch, and none had yet been made, or called for as a mercantile commodity, of greater thickness.

In conclusion, a hope was expressed that on an early occasion the subject of puddled steel would be again brought under the notice of the Institution; for, if it possessed the qualities ascribed to it, it was worthy of the most careful consideration of engineers, who had to design large railway structures, as well as for other purposes. In India and distant colonies, to which so much material had necessarily to be transported for public works, anything which would tend to reduce the weight to be carried, and consequently the freight, was a point of the highest importance. The Institution was therefore under great obligation to the author for having elicited this information.

AMERICAN PATENTS.

List of American Patents which issued from June 14, to July 5, 1859, (inclusive,) with Exemplifications.

JUNE 14.

93. Washing Machine; Pleasant Armstrong, Camden, Alabama.

Claim—1st, The arrangement of the complete stationary rounds of the convex swing frame, on two semicircular lines of different diameters, so that the rollers on the smallest semicircle shall stand above and opposite the spaces between the rollers on the largest semicircle, in combination with the arrangement of the stationary rounds of the concave. 2d, The arrangement of two auxiliary treadle standards with the main standards of the tub, in the manner described.

94. Machine for Printing Addresses, &c.; John A. Barrington, Fredericktown, Ohio.

Claim—1st, A cylinder, constructed with grooved pins, or their equivalents, for holding forms of type, presenting them at a proper point, to perform the office of printing, and afterwards allowing them to be delivered from the cylinder. 2d, In combination with the cylinder, I claim the ribs, arranged upon an endless chain in such manner as to receive the forms of type. 3d, Securing the forms within the ribs, in such manner as to present said forms properly for printing, by means of the follower, catch, and spring. 4th, Adjusting the forms of type for printing and delivering them from the cylinder after printing, by means of a reciprocating bar. 5th, The inclined feed wheel, constructed with adjustable spring conveyors, and operating as described. 6th, Regulating and adjusting the speed of the endless apron by means of the inclined disc, friction wheel, set-screws, and crank screw.

95. Gauge for Measuring the Pressure of Fluid; Victor Beaumont, City of New York.

Claim—1st, So arranging respectively dome-shaped elastic discs of one or more spring chambers in pressure gauges, as that the pressure of steam, or other fluid, within said chamber is indicated by the motion of the disc or plate, which presents its convexity to the pressure. 2d, The manner of guiding the free end of a spring, consisting of one or more chambers, expanding by pressure from within, in order to prevent it from vibrating in any direction but that of its axis. 3d, In pressure gauges with a hollow spring chamber mechanism, I claim partially filling the space inside of chambers with a solid substance or substances, in the manner set forth.

96. Instrument for Measuring the Strength of Watch Springs; J. M. Bottum, City of New York.

Claim—An arbor, having a measuring spring affixed thereto, together with an index, and an attachment for attaching the hair spring to be measured, arranged in the manner set forth, and constituting a ready means of determining the exact force of said hair springs.

97. Churn; P. S. Devlan, Reading, Pennsylvania.

Claim—The employment in a churn in which the cream is acted upon by a blast only of a float, as described.

98. Ore Separator; William O. Bourne, City of New York.

Claim—1st, A sieve-bed, in which the opening or openings for the passage of the air water through it, are so contracted as to enforce an uniform action of the air or water through the entire surface of the sieve-bed, which may be made of sheet metal, or of any textile material, either separately or in combination, or of their equivalent. 2d, The application of a vibrating and shaking motion to a sieve-bed, in combination with a blast or current of air or water, in the manner described. 3d, The described adjustable blades for agitating the substance on the sieve-bed, and for regulating the discharge of the refuse substances over the front edge of the table. 4th, The separation of metals, or other heavy substances, from ores, or other materials, when upon a sieve-bed, by the gravitation of the lighter substances towards and over the front or waste edge, when acted upon by a current of air or water through a sieve-bed, in the manner set forth.

99. Marine Hand Propeller; E. C. Brackett, Newton Corner, Massachusetts.

Claim—The arrangement and combination of the adjustable oar, arms, D, oscillating shaft, hinged blades, rods, arms, E F, rod, and lever, as described.

[A number of propellers or blades are hung to a pivoted arm which is fixed to the end of a vertical post attached to the side of the boat, and they are operated by means of an arm, connecting rod, and lever, so as to give to them a swinging or vibrating motion, at the same time the blades are so hinged as to adapt themselves to the impact of the water in an inclined position similar to the act of rowing or sculling.]

100. Valve; William Bramwell, City of New York.

Claim—The sliding nut actuated by the screw, in combination with the hinged valve and toggle links, as specified.

101. Reefing Sails; Joseph Francis Brouard, Havre de Grace, France; patented in France, Feb. 2, 1855.

Claim—1st, Supporting the rolling yard between its points of suspension by the hook, the said hook being constructed and operated for the purpose of staying the rolling yard and holding it in position when the sail attached to it is acted upon by the wind. 2d, The construction of the boom iron for the purpose of placing the boom in position to prevent the chafing of the sail, as described.

102. Projectile for Killing Whales; Robert Brown, New London, Connecticut.

Claim—The flukes on the shank of the bomb, the line attached thereto, the groove or indentation in the barrel of the bomb, for the line as stated.

103. Self-priming Locks; J. S. Butterfield and Simeon Marshall, Philadelphia, Pennsylvania.

Claim—1st, The extension on the carrier, in the manner set forth. 2d, Disconnecting each primer from the roll with the raising of the hammer, in the manner set forth. 3d, The adjustable centre projection and thumb-screw, arranged and operated in the manner set forth.

104. Method of Attaching the Capping of Fence Posts; R. S. Cadwell, Andover, Ohio.

Claim—The projection or tongue formed on the top of the post, in connexion with the mortise in the capping, for attaching the said capping to the post and securing it by a batten.

105. MODE OF FASTENING LETTERS TO SIGNBOARDS, &c.; Thomas Champion and Thomas Motley, Washington City, D. C.

Claim—The placing or casting on the back of letters projections with solid cast or wrought shanks therefrom. Also, holes in said projections to fasten by screws, nails, or rivets, as described.

106. FLY-TRAP; I. S. Clough, Brooklyn, New York, and S. R. Burrell, City of New York.

Claim—The combination of the stationary cone, revolving catcher, and start and receptacle, when constructed as described.

107. SUGAR CANE PRESS; Thomas Crame, Port Atkinson, Wisconsin.

Claim—The combination of the pressure rollers with the main bearing wheel of a frame, which is so proportioned and supported that it can be rotated aroond a pivot post—but this I only claim when a fluid receiving vessel, conducting tube, an annular channel, and a delivery spout, are combined with the said frame, substantially in the manner described.

108. MANUFACTURING PAPER; S. S. Crocker and George E. Marshall, Lawrence, Massachusetts.

Claim—1st, The combination of internally heated drying cylinders with a steam box or boxes, arranged for the purpose of continuously, first, thoroughly drying paper, and then superficially moistening it, by the direct application of steam prior to the operation of calendering. 2d, The combination of a steam box or boxes, so arranged as to moisten paper superficially by the steam therein contained, with rolls which calender by pressure, as described.

109. LOOMS; Charles Crossley, Ellington, Connecticut.

Claim—1st, The combination of the series of vibrating tuft-formers and the vibrating reed, arranged as described. 2d, The combination of the weights, the knotted cord, and slotted arm, for the purpose of controlling the set-off of the tufting yarn beam.

110. DRAIN TILE MACHINES; Jones Daines, Birmingham, Michigan.

Claim—1st, The bar, c, and hooks, in combination with the cross-bar, when used for the purpose of opening the lid automatically. 2d, The bar, b, combined with the frames, in the manner mentioned, with the levers, for cutting off the tile by the returning of the plunger.

111. HORSE BRACKET; T. B. Davis, Lexington, Massachusetts.

Claim—The improved mode of fastening and confining it to the foot, by having the points of attachment bear directly upon the shoe, so as not to injure the ankle or fetlock, by galling on the hoof by compression, and also the machinery by which the bracket is adjusted to the size of the foot, and held more firmly and securely than by any other mode of attachment now known.

112. MILK CAN; E. R. Denniston, Middletown, New York.

Claim—A milk can, having its cover hinged to a flanch and provided with a plate and stopper, and having the guard hoop attached to the body of the can.

113. PLOUGHS; Eli Moore, Slabtown, South Carolina.

Claim—The arrangement of the beam, brace, clevis, foot, stock, and ring, constructed as described.

114. ATTACHMENTS TO LOCOMOTIVE ENGINES FOR REMOVING OBJECTS FROM THE TRACK; C. H. Eisenbrandt, Baltimore, Maryland.

Claim—The double suspension lifting platform, composed of the parts, the yielding network or flexible fender guard, or its equivalent, when arranged in the manner described.

115. OPERATING SWITCHES ON RAILROADS; Charles Foster, Eldridge's Hill, New Jersey.

Claim—The mode of operating switches by means of movable cams, or their equivalents, on the car, acting on a cam, or its equivalent, connected by means of levers with the switch rail.

116. MACHINES FOR DRESSING MILLSTONES; H. B. Gill, Ogden, New York.

Claim—The combination and arrangement of the pivoted segmental arm and slide with the striking lever and cam, or its equivalent, in the manner set forth.

117. MACHINES FOR MAKING HAY; T. I. Goff, Warren, Rhode Island.

Claim—The combination of the gathering rake and revolving rake, when arranged for joint operation, as set forth.

118. VENTILATORS; G. D. Greenleaf, Chatenugay, New York.

Claim—In combination with the cylinder, bell-shaped casting, and plates, the cup and register, for the purpose specified.

119. ROTARY ENGINES; Dexter D. Hardy, Cincinnati, Ohio.

Claim—1st, The arrangement of the rings, operating in the described combination with the pipes to pack the revolving shaft in its connexion with the stationary cylinder, by the use of steam or water pressure. 2d, The combination and arrangement of the revolving shaft containing the receiving and discharge ports with the stationary cylinder and valves.

120. HORSE RAKES; Henry Hersh, Lancaster, Pennsylvania.

Claim—The arrangement and combination of the S-shaped teeth, lock, revolving axle, and clearers, as described.

121. OMNIBUS REGISTERS; H. C. Howells, City of New York, and J. C. Howells, Madison, Wisconsin.

Claim—1st, The employment of a yielding platform to determine the value of the entry or fare, and in combination with doors, or equivalent devices, to secure the registration of persons standing upon it, previous to their ingress or egress. 2d, The employment and use of the circular or segmental doors, or equivalent devices, having within the area of their action a yielding platform, operating as set forth. 3d, In combination with the yielding platform, an operative lever, and vertical rod, and puppet, or their equivalents. 4th, The pin or bolt, in combination with the arm attached to the vertical rod, or their equivalents, for communicating motion to the registering levers by the action of the jointed arm, as specified. 5th, The registering levers, operated as set forth, or their equivalents, and in combination with the registering ratchet wheels and the spring pawls, together with the double dial for registering the whole or half entries or fares. 6th, The stationary brushes, and the arrangement and combination of levers and rods, or their equivalents, for operating the doors and steps, as set forth.

122. SOWING MACHINES; Solon P. Hubbell, Unadilla, New York.

Claim—The combination of the bar having teeth, angular notches, and clearers, with hopper, its pins,

and slide blocks, arranged as set forth. Also, in combination with the hopper, pins, slide blocks, and regulating plate, the reciprocating bar, with its clearers and stirrers, arranged in the manner described.

123. TUNING KEY-BOARD; Richard Humphreys, Jonesborough, Tennessee.

Claim—The described compound tuning reeds, necessary to represent the corresponding keys in the general scale of musical notations.

[The nature of this invention is in combining on a rectangular board, any desired number of octaves of properly tuned reeds similar to those used in melodeons, to represent a corresponding number of octaves of the natural scale of musical notation (or white keys of a piano-forte), and another set of correctly tuned reeds to represent the semi-tones of the octaves in such a manner as to enable the musician, by comparing the tones of his instrument with those of the key-board, to detect and correct the least departure from the correct tone.]

124. WOOD SCREWS; Henry L. Kendall, Providence, Rhode Island.

Claim—A wood screw, having a thread of a ratchet tooth-shape, in combination with wide spaces between the convolutions thereof, on a stem cylindrical, or nearly so, and on a point of any suitable form. Also, making the threaded point of a wood screw in such a manner that the thread thereof (except the terminal convolution,) shall be of the same, or nearly the same, depth on its upper and lower sides, to give the screw a firmer hold of the wood, especially on its first entrance, than it would have if the threads on the point were made of gradually less depth toward the apex. Also, so forming the thread of a wood screw that it shall be of the same depth on the upper and under side, on the point and on the stem, (except the terminal convolution of the point, which is contracted rapidly in depth and width.)

125. BREECH-LOADING FIRE ARM; Daniel Leavitt, Chicopee, Massachusetts.

Claim—Effecting the locking and unlocking of the upwardly opening breech, and the starting of the same from its seat to open it, by means of a detached lever having a locking dog to enter a notch in the breech, and a toe to act against the bottom of the breech, as described.

[This invention consists in the employment, in combination with a breech-loading fire arm, of what the inventor calls a "combination packing," consisting of a piece of felt fitting snugly into the rear portion of the barrel, and a piece of stout paper, pasteboard, or other hard, inflexible material, of a form and size to pass easily through the barrel, the felt being placed next the breech of the fire arm, and the paper or hard material between the felt and the charge, that by the force of the explosion it may be driven back against the felt, and so caused to compress the same against the breech and spread it laterally against the sides of the chamber, and force it close against the joint, and so prevent the escape of gases and keep the joint perfectly clean. This "combination packing" is applicable to breech-loading fire arms of various constructions.]

126. SEWING MACHINES; James S. McCurdy, Brooklyn, New York.

Claim—1st, The combination of a reciprocating needle with a pair of loopers, or their equivalent, the combination as a whole operating in such manner that each successive needle loop is encircled by a tight coil of the thread of the preceding loop. 2d, The combination and arrangement of two loopers with a driver, operating in the manner described. 3d, Constructing and operating one of the loopers in such manner that a supplementary movement is imparted to it while the other is at rest, for the purpose of tightening the stitch.

127. MUSICAL INSTRUMENTS; H. T. Merrill, Galena, Illinois.

Claim—The gamut board, applied above and behind the keys, in combination with a sliding name-board, or its equivalent.

[The object of this invention is to facilitate the learning of the location of the notes and their indicative letters upon the base and treble staffs, and at the same time the association of the location of every note upon the staffs with its respective key on the key-board of a piano-forte, melodeon, organ, or other musical instrument having a key-board of a similar character. To effect this, a vertically sliding name-board, or board occupying the usual position of the name-board of a piano-forte, or similarly keyed instrument, extending the whole length of the key-board, a fixed or "staff-board," having represented on it the base and treble staffs, and the indicating letters of the notes arranged above their respective keys, are employed, the "staff-board" being so arranged behind the name-board as to be exposed by sliding up and concealed by sliding down the last-mentioned board.]

128. CULTIVATORS; Azel Smith, Westfield, Ohio.

Claim—The adjustable brace plates, frames, and cutters, when arranged as described, and in combination with the adjustable mould-boards.

129. LAMPS; Rufus S. Merrill, Lynn, Massachusetts.

Claim—In coal oil burners of otherwise ordinary construction, the combination with a flat wick tube of the removable director, constructed with inclined side walls and vertical ends, the latter being corrugated or grooved to fit the ends of the wick tube, as a means of securing the director to the wick tube, and for directing or conveying the heated vapors, mixed with atmospheric air, to the sides of the flame.

130. HANGING CARRIAGE BODIES; Leman C. Miner, Hartford, Connecticut.

Claim—1st, The application of the double-jointed shackle to the front axle, whereby the vertical position of the spring and axle is sustained, and the fifth wheel and appendages dispensed with. 2d, The back axle braces with double joints to admit a free and easy vertical motion of the springs, and supporting the axle in its upright position.

131. VULCANIZING CAOUTCHOUC; Dubois D. Parmelee, City of New York.

Claim—The preparation and use of the ingredients described, with bromine, whether combined or not with sulphur, substantially as described.

132. STEAM PRESSURE REGULATOR; A. P. Pitkin, Hartford, Connecticut.

Claim—The forming a connexion with the reduced pressure pipe or chamber, A, and diaphragm spring or piston, or their equivalents, for the purpose of opening and closing a passage, C, between the high and reduced pressure pipes or chambers, A and B, as described. Also, the combination of passage, C, piston or valve, rod, lever, diaphragm spring or piston, and safety-valve, arranged to operate in relation to each other, as described.

133. DEVICES FOR SECURING THE CLEVIS TO PLOUGHS; R. B. Pringle, Coventry, New York.

Claim—The arrangement of the pin, feather or rib, spaces, clevis, beam, and groove, as described.

134. KEYS, &c., FOR PIANO-FORTES; Joseph Hoffacker and Joseph Richards, City of New York.

Claim—1st, The construction of the key-board, by substituting, instead of the usual keys, knobs connected with the main levers. 2d, The pivoted rod, in combination with the main levers. 3d, The construc-

tion of the damper, as set forth. 4th, The construction of the trigger and its action on the damper, as described. 5th, The construction of the hammer and its action, in combination with the principal lever, as described.

135. CLIP FOR CARRIAGE THILLS; Daniel J. Riker, Harlem, New York.

Claim—Extending the plate of the carriage clip, in the form of a spring, to the eye of the shafts, and causing said spring to operate on the aforesaid eye, in the direction of the pull, to keep the parts of the bolt and eye in contact.

136. SPEEDER AND STRETCHER FLYERS; John N. Sawtell, Chicopee, Massachusetts.

Claim—A flyer for spinning frames, when constructed essentially in the manner and for the purposes set forth.

137. METHOD OF VENTILATING CORN HOUSES; Noah Seitz, Mellmore, Ohio.

Claim—The arrangement of the openings with the wire grating, in combination with the secondary perforated floor, lathing, and ventilator, as set forth.

138. SAW-SET; Alex. Shoemaker, Carey, Assignor to James G. Hunt, Reading, Ohio.

Claim—The adjustable arm with the fingers and adjusting screw, in combination with the spring trip-hammer. Also, the spring and the trip-hammer, in combination with the adjusting frame, and rollers, and adjusting screws, when arranged as set forth.

139. CONSTRUCTING SHEET METAL COFFINS; Isaac C. Shuler, Amsterdam, New York.

Claim—1st, The arrangement of strengthening the lower part of a sheet metal coffin, by folding over and soldering together, consecutively in several thicknesses, the surplus metal of the sides and ends of a sheet metal tray, forming a rim all round the outside circumference of the base, and fastening the walls of the coffin firmly thereto. Also, the arrangement of fastening to the under side of this tray or bottom of the coffin, the frames, for the purpose of stiffening it. 2d, The arrangement of placing on the inside of a sheet metal coffin a metal tray, with scrolled edges, which rests on a flanch formed by turning in the walls of the coffin all round their lower edges, and fastening this train firmly thereto, and also to the walls, for the purpose of strengthening the structure. Also, the bars for strengthening this tray. 3d, The arrangement of scrolling or folding outwardly, and soldering, consecutively, each fold of the surplus edges of the walls of a sheet metal coffin, forming a rim all round the upper edge of the walls, for the purpose of strengthening and securing the same in straight lines for jointing. 4th, The arrangement of forming on the inside of the upper edges of the walls of a sheet metal coffin, a scrolled rim on the piece, for the purpose of more firmly supporting the air-tight cover, and also for the purpose of securing the cover by screws as well as by solder when desirable. 5th, The arrangement of fastening on the outside of a sheet metal coffin, between the stiffening rims of the upper and lower edges of the walls, the studs or pillars at the corners and along the sides and ends in any required number, according to the size of the coffin, for the purpose of stiffening the sheet metal, in order that the structure may sustain a heavy weight. 6th, The arrangement of scrolling and soldering together the surplus edges of the air-tight cover of a sheet metal coffin, and beading the same, which, on being turned under, serves to fit the groove as well as to stiffen the cover. Also, the stiffening bars, as described. 7th, The arrangement of pressing a recess in the sheet metal all round the windows of a sheet metal coffin for receiving and supporting the glass. Also, the arrangement of supporting the glass by a flanch formed by the extension of a second inside sheet of the double cover. 8th, The arrangement of fastening the glass in these recesses, by means of metal sashes fastened to the coffin lid. 9th, The flanches formed on the outer edges of the sheet metal blinds, for the purpose of closing the metal sash, and securing the glass from the intrusion of dust, and from other annoyances. 10th, I am aware that I have claimed the bi-section of a hinged cover for the joint of the lid of a sheet metal coffin, according to the breaks in the side walls—I claim the cover, as applicable to a coffin with straight side walls in two hinged sections, as described.

140. SEEDING MACHINES; Andrew Simmons, Nora, Illinois.

Claim—The arrangement of the boxes in relation to the agitator, plates, and in combination therewith, the hollow drill tooth, the several parts being so constructed as to form a broad-cast seed planter and drill.

141. MACHINES FOR BINDING GRAIN IN BUNDLES; James D. Osborn, Constantine, Michigan.

Claim—A binding knot composed of three loops passed through each other, when said passing of the loops through each other is effected by machinery driven or moved from any of the moving parts of a harvesting machine, and whether accomplished by the means herein stated, or by their substantial equivalents.

142. THE CONSTRUCTION OF SLED RUNNERS; John M. Spooner, Springfield, Massachusetts.

Claim—Making both of the runners and the bearers of a sled or sleigh, or other similar vehicle, of one continuous piece or rod of steel or other metal, as set forth.

143. SEEDING MACHINES; Enos Stimson, Plainfield, Vermont.

Claim—The arrangement and combination of the shaft, F, box, E, shaft, M, arm, O, and box, N, as described.

[This invention consists in a combination and arrangement of a broad-cast and drill and hill-distributing device, whereby two different kinds of seed may be sowed simultaneously—one broad-cast, the other in hills and drills, and either allowed to be used separately when desired.]

144. BREECH-LOADING FIRE ARMS; Wm. Mount Storm, City of New York.

Claim—Such an arrangement of the links, as described, and their connexion with the breech piece and lever, that they shall jam forward and firmly hold the former against the rear of the bore of the barrel after it has ceased its motion transversely to the latter, and vice-versa, release the breech piece (in opening the breech) before its movement commences. Also, the perforated breech piece, in the manner described. Also, arranging the horn or head of the hammer, in the manner described.

145. THE RUNNING GEAR OF SLEDS; R. Sutton, East Avon, New York.

Claim—The arrangement and combination of the sliding collar, rods, reach, sliding bolster, pendants, links, and runners, as described.

146. STOP-COCK; Isaac C. Tate, New London, Connecticut.

Claim—The application of the spring, in the manner set forth, and for the purpose described.

147. WHIFFLETREE HOOKS; Lewis C. Terry, Chenango, New York.

Claim—A hook, pivoted or hinged to its supporting eye, which is cut away or flattened on its back, in the manner described, so that the point of the said hook, being in contact, or nearly so, with its said holding eye, will securely confine a link, a ring, a staple, a trace, or similar object, in all positions, excepting when turned

back upon the said flattened or eccentric part of the eye, as set forth. Also, the right, in addition to the above, to so construct the hook and eye that the hook shall have but one motion, viz: a horizontal motion directly around the circle formed by the said eye, so that the said hook shall not drop or work from side to side—and the exclusive right to use the same in either or both the forms above mentioned and described, for all purposes for which they may or can be used, when constructed as set forth.

148. CULTIVATORS; Joseph Thirlwell, Galesburg, Illinois.

Claim—The arrangement of the frame, the iron bows, the hinge bow, the tongue braces, and lifting chain, when constructed in combination for the purposes set forth.

149. SEEDING MACHINES; Franklin Veal, Hallettsville, Texas.

Claim—1st, The arrangement of the windlass, the hand lever, H, and the lever, N, in combination with the smoothing roller, the hopper, and the harrow, and in such relation to the driver's seat, that they can be operated from the same. 2d, The combination of the fan cylinder with the hopper, as described.

[The hopper box in this invention is arranged with a harrow and a smoothing roller in such a way that all of them, or each for itself, can be operated from the driver's seat, the hopper box being hinged and provided with a lever, whereby the box can be brought in such a position that the flap board or valve is not opened by the cam or that the same is opened for the purpose of discharging seed, and the harrow is suspended from a rope or chain in such a manner that the same can be lifted clear from the ground by means of a hand lever that can be reached from the driver's seat, and the smoothing roller is attached in such a way that it can be raised from, or lowered to, the ground by means of a windlass that is operated by a handle from the driver's seat.]

150. RAILROAD CAR COUPLINGS; David Warren, Gettysburgh, Pennsylvania.

Claim—The arrangement of the adjustable plate, as constructed with the pin, arm, rock shaft, and guards, when operated substantially in the manner set forth.

151. ROCK DRILLS; Lyman White, Davenport, Iowa.

Claim—1st, Placing the bearings of the shaft to which the box and drill carriage are attached in bar, which are fitted in annular parts of the supports, and arranged so as to admit of the facile adjustment of the drill to any angle or position required. 2d, The employment or use of the racks on the bars, in connexion with the wheels on the shaft, the screws attached to the sliding bearings by the bars, the wheels on the upper ends of the screws and the pins on the cranks, arranged as shown, to feed the drill to its work.

152. CAR COUPLINGS; Gilbert Yates, West Dresden, New York.

Claim—The combination of the chains and clasps with the bent and lifting rods, grooved parts and chains, arranged in relation to each other, in the manner set forth.

153. GRAIN-HULLING MACHINE; Wm. Zimmerman, Quincy, Illinois.

Claim—The conduits arranged to receive the grain scoured or operated upon by the first or each revolving scourer, when operated on a horizontal shaft, and conducted to the centre or central part of the second or next revolving scourer, and so on in succession through the whole series of scourers, until it passes out of the machine.

154. GRAIN BINS; Daniel D. Badger and W. S. Sampson, Assignor to Daniel D. Badger, City of New York.

Claim—The arrangement and combination of the metallic bins, in the manner described.

155. MACHINES FOR SHAPING THE BACKS OF BOOKS; John E. Coffin, Assignor to A. G. Gerrish, Portland, Me.

Claim—1st, The arrangement of the sliding holding jaws and the reciprocating roller carriage, as described. 2d, Combining the toggle mechanism which operates the clamping jaws, and the screw which operates the roller carriage with a cam and pulley, or its equivalent, on the same shaft, in such manner as to make a machine for shaping the backs of books, which is perfectly continuous and automatic in its operation, and to and from which the books only require to be introduced and removed by the attendant at the proper stage in its operation, as described.

156. MACHINE FOR CUTTING INDIA RUBBER INTO THREADS; Joseph W. Cox, Malden, Massachusetts, Assignor to Horace H. Day, City of New York.

Claim—1st, In combination with the concave rotary cutter, the employment of a tube placed in the concavity thereof, for the discharge of a jet of water against the cutting edge. 2d, The carriage with its divided clamps and follower, in combination with a rotary cutter, or any equivalent cutter, for the purpose set forth. 3d, And finally, in combination with the carriage clamp and follower, the mechanism, or any equivalent thereof, for operating the follower, as described.

157. MACHINE FOR BORING BLIND STILES; Daniel Dunham, Assignor to D. D Sweet, James Bromily, and E. W. French, Pawtucket, Rhode Island.

Claim—1st, The rack, or its equivalent, in combination with the sliding carriage and with the dog, as described. 2d, The lever, arranged with the nose, in such relation to the treadle that by its action the dog is operated, as specified.

158. TRIP-HAMMERS; Bennet Hotchkiss, Assignor to self and F. S. Collins, New Haven, Connecticut.

Claim—My improved means of operating the hammer, that is, by an air spring cylinder, or its equivalent, applied to the piston and combined with mechanism, by which a rapid reciprocating rectilinear motion may be imparted to such cylinder, essentially in manner and so as to operate the piston and hammer, as specified. Also, in combination with the piston trip-hammer, the air spring cylinder and the mechanism for imparting to the latter reciprocating rectilinear motions, as described, mechanism for varying the altitude of the path of movement of the cylinder, under circumstances as explained, such mechanism as above described, consisting of an eccentric bearing shaft applied in boxes, and to the crank shaft of the cylinder.

159. COMPOSITION FOR CEMENTING IRON; Job Johnson, East Brooklyn, New York, Assignor to Charles D. Archibald, London, England.

Claim—The combination and use of lime, bone dust, and charcoal, in the manner and for the purposes described.

160. SPINNING TOPS; Francis Milward, Assignor to H. Homan, W. L. Thomas, and D. D. Hardy, Cincinnati, Ohio.

Claim—A combined gyroscope and spinning top, constructed in the manner set forth.

161. SEEDING MACHINES; Daniel Nichols, Assignor to Charles and Edward Rumley, Onarga, Illinois.

Claim—The combination and arrangement of hinged bars, slotted arc, driving wheels, and auxiliary seed hopper, when the same are arranged in the manner specified.

162. Rolling Metal for Jewelry; John S. Palmer, Assignor to self and Charles S. Capron, Providence, Rhode Island.

Claim—The employment of a tapering die, in combination with the pressure rollers, as specified.

163. Attachment for Alarm Clocks; E. T. Quimby, Assignor to self and Newton Brooks, New Ipswich, New Hampshire.

Claim—1st, The wheel, or its equivalent, having a series of projections, which, or some of which, can be covered up or removed, and operating in combination with the hammer, as described. 2d, The arrangement of the slides to operate in combination with the wheel and with the hammer, in the manner specified.

164. Corn Harvesters; George W. Richardson and James W. White, Grayville, Assignors to selves and George M. Weed, White County, Illinois.

Claim—The combination of the gathering wheels, terete rollers, stripping plates, and guide plates, as set forth. Also, the combination of the fender or guide plates, meeting the points of the rollers with the terete rollers and stripping plates, as set forth.

165. Water-wheel; Robert Ross, Assignor to self and George J. Stannard, St. Albans, Vermont.

Claim—The plate or gate placed within the water passages of the wheel, provided with the vertical projections at the issues, and attached to the rod within the shaft of the wheel, as set forth.

166. Railroad Cars; Henry Webb, Assignor to S. L. Wilder, Cincinnati, Ohio.

Claim—The angular rail, when constructed so as to be convertible and present a new surface after the first surface has been worn out, in the manner specified.

167. Means for Actuating Movable Parts of Fire Arms; Thomas Bailey, New Orleans, Louisiana; patented in England, December 3, 1858.

Claim—Combining a toothed wheel or pinion on a traveling centre, and working between guides with a pair of racks, one of which is stationary and the other movable, having connected to it the part of the fire arm to be moved, the toothed wheel changing its position or traveling in the same place with the guides.

JUNE 21.

168. Instrument for Gauging Casks; John K. Barney, Warren, Rhode Island.

Claim—The calliper, the slides, the triangular calliper bracket and pins, and their combinations in the instrument, by which the true diameter at the bung of any cask can be obtained, however thick the sediment therein may be. I do not confine myself to the particular manner of fastening the parts in the instrument, but to the principles of the construction of the instrument.

169. Slide Valves for Steam Engines; R. C. Bristol, Chicago, Illinois.

Claim—The construction and arrangement of the partial rollers when sustained in their respective positions, in the manner set forth. Also, the described arrangement of the supported back-piece, loose face-piece, cut-off means, and the united passages, in the respective parts, A B, whereby the parts, A B, are allowed to work to a limited extent relatively to each other, without affecting the action of the steam, nor allowing an escape of the same through the joints. Also, in connexion with the above arrangement of the several parts, the described method of adjusting the parts, A B, relatively to each other, that is to say, working the parts, A B, for a period in a free relation, and then tightening the union by the set-screws, or their equivalents, until it becomes rigid, as described.

170. Sugar Mills; John Burge, Terre Haute, Indiana.

Claim—The combination and arrangement of one large and two or more small cylinders, with the strippers for stripping the leaves off the cane, and the scraper or separator for cleaning the cylinder and carrying off pressed cane, the whole constructed as described.

171. Double Seaming Machine; William Burton, Cazenova, New York.

Claim—1st, The use of a working head, in combination with a disc or "former," when arranged to produce an outward or eccentric draft, and at the same time accomplish the turning down of the double seam, as set forth. 2d, The working head, in combination with the shaft, which is adjustable up and down, and supports a tapper or straight-sided "former" or disc, and with the working head frame adjustable longitudinally, as set forth.

172. Boiler; O. S. Camp, Fairfield, Iowa.

Claim—A boiler made of double walls, and a single top and bottom, said top having flanches to fit against each wall, and the communication between the interior of the inner boiler and the space between the walls being made by closed passages, such as described.

173. Railway Chairs; Marion Carpenter, Cincinnati, Ohio.

Claim—The combination of the lugs with the base piece for sustaining the elastic cushion and its follower, in the manner set forth.

174. Sugar Mills; J. W. Chapman, Trinity Springs, Indiana.

Claim—The combination and arrangement of the forked lever crushing wheels, bearings and table or bed timber, the table being prepared with notches to receive the projections on the sect of the bearings and key-wedge, as set forth.

175. Shingle Machine; C. G. Conover, Jefferson, Wisconsin.

Claim—1st, The employment or use of the fence, in combination with a reciprocating splitting knife and reciprocating or shoving plate, arranged to operate as set forth. 2d, The reciprocating splitting knife, shoving plate, tapering knives, jointers, and clamp, combined and arranged to operate as specified. 3d, Operating the bolt carriage by means of the revolving arm on the shaft, and the obliquely toothed rack at the underside of the carriage, as described.

176. Straw Cutters; Reuben Daniels, Woodstock, Vermont.

Claim—1st, The combination with the roller of the convex teeth, having the major diameter of their bases arranged parallel with the axis of the roller, as described. 2d, The arrangement and combination of the roller, cutter, and cylinders, as described.

177. Hulling Clover; Nathaniel Eames, Hanover, Pennsylvania.

Claim—The combination of the screen with the cylinder, when said cylinder is provided with a spiral groove and a spiral strip of rubber, constructed in the manner specified.

178. CONVERTING RECIPROCATING INTO ALTERNATE CIRCULAR MOTION; Henry Ehrenfeld, City of New York.

Claim—1st, Arranging the lever and dog, in combination with the grooved wheel, or its equivalent, in such a manner that the dog acts on the wheel entirely independent from the centre or hub of the wheel, and that the lever can be brought in such a position as to impart motion to the wheel, in either direction, as specified. 2d, In combination with the lever, dog, and wheel, I claim the arrangement of the groove, or its equivalent, in the hub of the wheel, for the purpose of keeping the dog in the proper position, and to prevent the lever from tipping over sidewise, as specified.

179. CHEESE PRESSES; A. H. Emery, Mexico, New York.

Claim—The method of moving the follower upwards, by means of the weight, the cords, and the pulleys, arranged as described. Also, the arrangement of the arm, the ratchet, the pinion, the crank arm, together with the wheel, with the cogs either on the inside or outside, arranged as described.

180. SASH FASTENERS; A. H. Emery, Mexico, New York.

Claim—The construction of a window sash spring and fastener of drawn pipe, with the end, g, and the end, h, arranged and fastened therein, as described. Also, the construction of the knob-rod or bolt, as described.

181. ATTACHMENT OF HANDLES TO TIN PAILS; Thomas Evans, Watkins, New York.

Claim—Forming metallic ears for pails, buckets, and other vessels, with concentric angular corrugations surrounding the bail orifice, in combination with the flattened hook, the end of the bail, provided with an additional bearing against the surface of one or more of said corrugations, and the drop opening or downward continuation of the outer corrugation, in the manner described.

182. CORN PLANTERS; P. H. Freylinghousen and J. G. Heilman, Johnstown, Pennsylvania.

Claim—The perforated wheels, G, when hung to the sliding bars, and situated in respect to the hopper, and wheels, H, and otherwise arranged as set forth, so that on moving the said bars inwards, the wheels, G, may be drawn out of gear, and the orifices of the hopper at the same time closed by the wheels.

183. ROLL FOR FORMING TIRES; J. H. Gage, Nashua, New Hampshire.

Claim—The combination of the flanch, B, recess or depression, C, wide shoulder or tread, L, flanch, C, and short shoulder, D, with a series of thin metallic discs, said parts being constructed relatively to each other, in the manner set forth.

184. RETORTS FOR DISTILLING COAL OILS; H. P. Gengembre, Alleghany, Pennsylvania.

Claim—1st, The use of an L-shaped retort combined with charging boxes, crusher, and discharging tube, capable of being subjected to a degree of temperature at the end of the horizontal part at which the residuum of the substance under treatment is discharged higher than at the upright part at which the coal is charged, the whole so arranged as to avoid the admission of atmospheric air. 2d, The combination with my retort, constructed as described, of a crusher suited to the material to be distilled, placed within the retort at a point intermediate between the points where the heat is highest and lowest, for the purpose of breaking up the coal, or other substance, before the process of distillation is complete.

185. SEWING MACHINES; H. H. Goodwyn, New Orleans, Louisiana.

Claim—1st, The combination of the loosely fitted double conical sleeve with the soft leather or elastic backed and bearing eye, and a spring pressure, whereby the spool is brought to a proper centre, and the requisite tension produced, the cone sleeve revolving simultaneously with the spool and pivoted arm, and the friction or tension being obtained by the action of the outer end of the double cone against the elastic eye, in the manner described. 2d, The arrangement with the above of the peculiar spring pressure described, consisting of the pivoted or rocking standard, rod, spring, and rosette or nut, for operation together and with the spool, in the manner described. 3d, The attachment to the stationary shell or outer case of the tension arm, in the manner described. 4th, Hanging the bobbin on, and so as to rotate together with, a cylinder, when the same is combined with a spring inducing friction in the run of the bobbin, and operating in connexion with a tension arm or elbow acting on the thread from the bobbin, as described.

186. APPARATUS FOR HEATING BUILDINGS; S. F. Gold, Cornwall, Connecticut.

Claim—Constructing the generator of a series of similar cast metal sections, each complete in itself, and united substantially as described, so that the capacity of the generator will be governed by the number of sections used, and may be increased or diminished by adding or removing any desired number of the internal sections. Also, constructing these sections so that when united, there will exist the chambers rising above the water line and out of the draft of the furnace, as set forth. Further, in combination with the generator, the supplementary steam chambers made up of flat cast metal sections, as specified.

187. TANNING; Jacob Gove, Milford, New Hampshire.

Claim—Stirring the liquor or tanning fluid in the vat by means of a stirrer, constructed, arranged, and operated in the manner set forth.

188. MACHINE FOR CHAMFERING BARREL HEADS; John Greenwood, Rochester, New York.

Claim—The arrangement of the sliding frame, clamps, cam, lever, and gearing, in connexion with the circular dish-shaped saw and cutters, arranged for joint operation, as specified.

189. ELECTRO-MAGNETIC MACHINE; Thomas Hall, Boston, Massachusetts.

Claim—The combination of the spring connecting bar and the switch, placed between the machine and the battery, and operating with reference to each other, as described.

190. CONNECTING THE IRON GIRDERS OF BRIDGES; Joel T. Ham, Covington, Kentucky.

Claim—1st, Combining the posts and braces with the cords by means of the metal saddles, and the metal stirrups or straps, applied as described, whereby the expansion and contraction of the cords, posts, and braces, by changes of temperature, is provided for. 2d, The india rubber blocks or springs, applied between metal blocks, in combination with the saddles and stirrups, as set forth.

191. GUARD FINGERS FOR HARVESTERS; A. Hotchkiss, Sharon, Connecticut, and John P. Adriance, City of New York.

Claim—1st, The angular cavity for the free admission of the front end of the face plate to permit its shoulders, at the rear end, to be inserted, whereby the ends of said plate are firmly secured, in the manner specified. 2d, Confining the back end, c″, of the steel face plate, by bending down the metal of the finger upon the reversely beveled edges of c″, in the manner described.

192. TRACE FASTENER; Daniel H. Hull, Plantsville, Connecticut.

Claim—The combination and arrangement of metal plate, spring latch, spring, and knob, in the manner set forth.

193. Snow Ploughs for Railroads; W. S. Huntington, Andrewsville, New York.

Claim—The employment or use of the plates or scrapers attached to arms of the shafts, which shafts have springs attached, and are connected to an adjusting bar by means of the arms and rods, the whole being applied to a car, and arranged to operate as set forth.

194. Tools for Fastening Bale Hoops; E. A. Jeffrey, Corning, New York.

Claim—1st, The employment or use of the combined pliers and die, arranged as set forth. 2d, The combination of the pliers and hammer with the pliers and die, arranged for joint operation, as described.

195. Chamfering Tool; Wm. Johnson, Jr., Hampstead, New Hampshire.

Claim—Supporting the knife and adjusting it with reference to the sole rest and the edge bearer, viz: by means of a carrier and adjusting screws, applied and arranged with respect to the sole rest, the edge bearer, and the presser, as described.

196. Apparatus for Cutting Teeth in Saws; K. H. Kinne, Mexico, New York.

Claim—The movable curved switch, in conjunction with the curved groove, for the purpose of adapting the machine to the cutting of teeth, on setting or sharpening the teeth of straight as well as circular saws. Also, operating and feeding the burr, by means of the shaft turning within the hollow screw shaft, when applied to a saw sharpener, in the manner described. Also, the bed-piece or anvil, for the purpose of supporting the saw teeth while being sharpened. Also, in combination with the burr and the anvil, the clamps for gauging and firmly holding the saw whilst being acted upon, as described.

197. Ship's Capstan; David Knowlton, Camden, Maine.

Claim—Fixing the shafts of the stud gears in a revolving plate arranged to turn with the barrel and head when they are locked together, and to be stationary when they are unlocked, in combination with two stud gears, by which the head and barrel are turned in the same direction when used as a geared or simple capstan.

198. Exhibition Rocket; Andrews Lanergan, Boston, Massachusetts.

Claim—Making the rocket with a match arranged and fixed in the choke, and protected or covered by a plane or thin disc, having no opening into the choke, nor any cavity or recess to hold the match or catch sparks. And I particularly claim attaching the match, as described, to the inner surface or side of the choke, or arranging the attachment therein, and with respect to the lower end of the match, the same not only enabling the match to be confined to the choke of the rocket, but to have a portion of it, after breakage of the cap, capable of being bent downward out of the choke into a convenient position for being fired.

199. Sled Brake; Albertus Larrowe, Cohocton, New York.

Claim—1st, Constructing the brake eyes in the peculiar form shown and described. 2d, The combination of the brake eyes with the brake, as described.

200. Whip and Line-holder for Guiding Horses without the use of the Hands; Lucius Leavenworth, Trumansburg, New York.

Claim—The arrangement of the rein-hooks or knobs which are united by one or more cross-bars or braces, and which are provided with a whip-socket, or without the same, in such a manner that a frame is formed, which, by the aid of suitable shoulder straps, or their equivalents, may be secured to the body of a person, as described.

201. Cork Machine; Harvey Locke, South Boston, Massachusetts.

Claim—1st, The employment or use of a reciprocating knife-stock, when provided with necessary knives, and arranged in combination with a rotating mandrel, traversing clamp, and feed-spout or trough, so that as the knife-stock moves back and forth pieces of cork will be cut from the bar or slab, and said pieces turned in suitable conical form. 2d, In connexion with the reciprocating knife-stock, attaching the mandrel and head to an adjustable bar fitted in the framing, and arranged so as to admit of the adjusting of the pieces of cork more or less obliquely with the knife, and vary the taper of the corks as may be desired. 3d, Placing the clamp in a reciprocating plate operated by the lever, Q, from the wheel, and the lever, R, from the reciprocating knife-stock, E, for the purpose of giving the traversing movement to said clamp to convey the pieces of cork from the jaws to the mandrel.

202. Wind-mills; James K. Lum, Skookumchuck, W. T.

Claim—The employment or use of the fly or frame placed on the arbor, and having the ends of the cord passing through it, and attached to said arbor, said cords being also attached to the rope of the weight, the fly being operated by the wind-wheel, in such manner as to admit of a simultaneous rotation of the arbor.

203. Grinding Mills; J. C. Lyons, Auburn, and Henry F. Phillips, Seneca Falls, New York.

Claim—1st, The arrangement and combination of the clasp, pin, screw, hand-wheel, and shaft, whereby the said shaft and grinding cone may be readily adjusted and firmly secured, whether the machine is in operation or at rest. 2d, The arrangement and combination of the double-flanched pulley, shaft, fork, rod, and shell, as described, so that by the adjustment of the shaft, the shell will also be adjusted.

[By the use of this mill grain may be ground finer or coarser, as desired, for the hub of the hand-wheel is provided with a screw, that is placed in such connexion with the grinding cone and corn-cracker that by turning the hand-wheel the shaft receives a longitudinal sliding motion that adjusts the cone to grind to any degree of fineness, and its free rotation is not interfered with.]

204. Potato Diggers; Perry Marcy, Tunkhannock, Pennsylvania.

Claim—The arrangement of the inclined smooth belt, tightening pulley, shield, ratchet wheel, levers, and bars, provided with teeth, constructed in the manner set forth.

205. Construction of Driving Shafts for Mills, Cotton Gins, &c.; James Massey, Thomasville, Georgia.

Claim—Suspending the driving shaft, in the manner described, to allow it to rise or fall with the floor, to which it is attached, operating substantially in the manner set forth.

206. Drainage Pipe; Thomas J. Mayall, Roxbury, Massachusetts.

Claim—Combining with a stationary washing bowl sink, washing tub, or other similar articles, the elastic drainage pipe terminating in a wedge-shape, in the manner described.

207. Corn and Cane Harvesters; H. D. McGeorge and D. C. Greer, Morgantown, Virginia.

Claim—Providing a corn or cane harvester with a vertical reciprocating cutting apparatus, for the purpose of cutting the stalks into two or more pieces, in the manner described.

208. Machines for Sawing Stone; Andrews T. Merriman, Chicago, Illinois.

Claim—The lowering the saw frame by means of the long screws acting on the sliding bars, and the stiff

connecting rods hung with hinge joints at the saw frame, and the sliding bars (instead of chains or ropes), for the purpose of holding the saw frame steady and prevent any jumping motion.

209. WINDOW CURTAIN FIXTURE; Purches Miles, New Britain, Connecticut.

Claim—1st, The compound hanging bracket, capable of being raised up to permit the opening and closing of blinds, or for other purposes. 2d, Constructing and combining the parts, as described, so that the bracket can be attached to the top, side, or back of the window frame, and at either side of the window. 3d, Holding the band against a pulley having a friction surface by an arm or arms, as set forth.

210. CORRUGATING METALLIC SHEETS; Richard Montgomery, City of New York.

Claim—The waved corrugated wrought metal plate for boilers, in combination with the margins of greater thickness than its middle, as described.

211. INSTRUMENT FOR ADDING NUMBERS; John B. Newbrough, St. Louis, Missouri.

Claim—1st. The bent arm underlying the dial, so as to operate it without obstructing the vision. 2d, The stud, operating in the described connexion with the pawl to permit the backward motion of the dial, for the purpose set forth. 3d, The combination and arrangement of the rib, cavity, catch, and teeth, operating as explained, to shift the obstructing plate at each revolution of the dial, and arrest the reverse motion of the latter at the right instant in setting the machine. 4th, The described arrangement and combination of the pins and hook, operating in the manner set forth.

212. MACHINES FOR HARVESTING BEANS; S. Van Rensselaer Newman, Covington, New York.

Claim—1st, The employment or use of the rotary sickles, provided with scolloped-shaped teeth, and arranged to operate as set forth. 2d, The combination of the endless chain of rods with the rotary sickles. 3d, The combination of the rotary sickles, endless chain of rods, platform, with or without the rake, placed in a mounted frame, and arranged for joint operation.

213. FIRE-BACK FOR STOVES AND FIRE-PLACES; Andrew O'Neill, Portsmouth, Ohio.

Claim—The hooded damper, in combination with a radiating fire-back, arranged as described.

214. CULTIVATORS; James Peeler, Tallahasse, Florida.

Claim—The arrangement of the bars, D and E, beam, handles, and standard, the bar, E, forming a brace, a coulter, and a landside, and the bar, D, being provided with an inclined or tapering point, on which any style of blade may be secured, the two bars being pivoted together, and the whole operating in the manner specified.

215. MACHINES FOR CUTTING SUGAR CANE; Albert Philipp, Mayville, Wisconsin.

Claim—The arrangement of the cutters, H′, with the forked arms, I′, and with the endless apron, in combination with the cutters, H, the forked arms, I, the reels, and the additional platforms, to operate in the manner specified.

216. APPARATUS FOR MANUFACTURE OF PAPER PULP; Joseph B. Palser and Gardner Howland, Fort Edward, New York.

Claim—1st, Having the pipe, b, which passes through the hollow journal of the boiler, divided by a partition, so that the steam may find exit through one compartment of the pipe, and the contents of the boiler through the other compartment. 2d, The employment of the perforated diaphragm, when arranged as described, to protect the pipes, h h′ s s′, and strain the liquids from the "stock." 3d, The arrangement of the boilers, J J′, with the surrounding envelope, as described, so that the resultant liquids of the boiling may be evaporated, and also employed to cool down the boilers and surrounding envelope. 4th, The arrangement of the basin below the boiler to receive the falling liquid, as described. 5th, The injection of the steam arising from the boiling of the alkaline and other contents of boiler, J′, into boiler, J, and vice-versa, as described. 6th, The arrangement of the warming chamber between the two boilers, and the combination therewith of the pipes, T V W W′, as described. 7th, The arrangement and combination of the boilers, furnace, and doors, so as to apply the furnace heat to either or both boilers at pleasure, as described. 8th, The combination of the cylindrical bottomed vats, having the chimneys passing through them, with the boilers, as described.

217. MACHINES FOR SOWING FERTILIZERS; James Peeler, Talahassee, Florida.

Claim—The arrangement of the frame, wheels, axle, and apron, attached to the frame by means of straps, with the bar, metallic strip, corrugated wheel, bar, chuck, hopper, and slide, the whole being constructed and placed in the relative positions set forth.

218. BRAKES FOR POWER LOOMS; Rensselaer and Gordon B. Reynolds, Stockport, New York; ante-dated Feb. 8, 1859.

Claim—Applying and arranging the two faces of the brake relatively to its centre of motion, and the said centre of motion relatively to the centres of the crank and cam shafts, in the manner described, whereby the brake is not only rendered automatic in case of recoil after the stoppage of the loom by the action of the protector, but self-liberating when the loom is started again.

219. FILTER; Wm. Rice, Philadelphia, Pennsylvania.

Claim—1st, The general arrangement of the two casings, the perforated plates, the wire gauze, body of sand, the system of pipes, and three cocks, as described. 2d, Confining a body of sand between the perforated plates, by means of a ring, constructed in the manner set forth, or any equivalent thereto, by which the said ring may be made to compress the body of sand without disturbing the said perforated plates. 3d, The orifices at the lower ends of the pipes, for the purpose specified.

220. CIDER PRESSES; Christian Ritter, Reading, Pennsylvania.

Claim—The application of the chamfered and grooved inner slats and partitions, with their fastenings and arrangements, which will produce the intended effect.

221. BRUSH FOR WASHING WINDOWS; Philip C. Rowe, Boston, Massachusetts.

Claim—The hydraulic window-washer or brush, constructed with the spray-jet tube, and the conduit or pipe applied to its stock and handle, in manner as specified.

222. COOKING RANGES; Wm. G. Ruggles, Worcester, Massachusetts.

Claim—The arrangement and combination of the oven, D, provided with a central hollow shelf, b, the oven, G, provided with a hollow shelf, m, fire chamber, B, damper, E, chambers, h d, flues, c H n n′, as described.

223. DOOR FRAMES FOR FURNACES; Paul A. Sabbaton, Albany, New York.

Claim—The combination of the mouth of the furnace of the door frame and door, when the said door

frame is provided with an opening larger than the door into which the door shuts, so as to close against the furnace or against a shield or false frame, as described.

224. TOOL FOR PLANING AND FINISHING THE EDGES OF BOOT AND SHOE SOLES; Henry Sauerbier, Newark, New Jersey.

Claim—The combination of the collis and edge plane, in the manner specified.

225. HARVESTING MACHINES; Wm. and Thomas Schnebly, Hackensack, New Jersey.

Claim—The arrangement and combination of the inclined tapering discharge trough, with the concave or curved platform and raker-reel, whereby the grain is made to fall from the machine in compact gavels, as described.

226. HARVESTING MACHINES; Wm. and Thomas Schnebly, Hackensack, New Jersey.

Claim—The employment, in combination with the pendulous levers, d d', of the toggle levers, g g, as shown, whereby the levers, d d', may, without shifting their axes of motion, be thrown in or out of connexion with the drivers.

227. WATER-WHEEL; Jonas Smith, Westport, Connecticut.

Claim—The arrangement and combination of the annular gate, when provided with the tangential vertical plates, stationary rim, interposed between the gate, and wheel, when provided with buckets having lips, all as described.

[To that class of horizontal water-wheels called "centre discharge wheels," this invention will be found to be applicable. The invention consists in the employment of a circular gate, formed of a series of guide passages, and placed over or around a stationary rim having induction openings made in it, the wheel having peculiar buckets—the whole is so arranged that the admission of water to the wheel may be regulated as desired with great nicety, and in such a way that the greatest effect will be produced from a given volume of water, whether it be large or small.]

228. MEASURING FAUCETS; Joseph Smith, Cincinnati, Ohio, and G. B. Griffin, Madison, Wisconsin.

Claim—1st, Operating the plunger by means of the cam grooves on the face of wheel, in connexion with the pins on the sleeve, when both are constructed and operated in the manner set forth. 2d, The serrated circular register plate, in connexion with the ratchet and pointer, in the manner specified. 3d, The disc, constructed as described, in combination with the inlet pipe and the outlet pipe.

229. MACHINE FOR JOINTING STAVES; John G. Stephenson, Buffalo, New York.

Claim—The adjustable plates with yielding cutter stocks or plates attached in connexion with the feed rollers and yielding pressure plate, or its equivalent, arranged to operate as set forth.

230. CULTIVATORS; J. C. Stoddard, Worcester, Massachusetts.

Claim—The arrangement and combination of the slotted, adjustable, reversible blades, arms, and hub, as described.

231. PANORAMIC ATTACHMENT FOR CLOCKS TO INDICATE THE COMPARATIVE TIME IN ALL LONGITUDES; Giles M. Stone, Fredericksburgh, Virginia.

Claim—1st, The chronometer dial divided off into 24 equal parts for indicating the 24 hours of day and night, by one revolution of the index point. 2d, The revolving disc representing the northern or southern hemisphere, for indicating the relative time of day or night, at any and all localities thereon. 3d, The combination of the revolving disc with the 24 hour dial, for demonstrating the cause of day and night by the diurnal revolutions of the former, representing the revolutions of the earth on its own axis.

232. COMBINED CASE FOR PEN, PENCIL, KNIFE, TOOTHPICK, &c.; John F. Sturdy, Attleborough, Massachusetts.

Claim—The case, constructed as shown, and provided with the blade knife, operated by the spirally slotted tube, pencil tube, toothpick, and pen-slide.

233. CLOTHES PIN; William H. Towers, City of New York.

Claim—A clothes clamp, formed of two parts jointed together at their upper ends, as set forth.

234. APPARATUS TO HOLD AND TURN THE LEAVES OF BOOKS AND MUSIC; Cyrus B. Thayer, Boston, Mass.

Claim—The combination and arrangement of the wedge-acting back pieces and clamps with their connecting dovetail tongues and grooves, so that simply raising the clamps shall unclamp and depress them, shall clamp the music sheets. Also, the arrangement and combination of the leaf-turning cords, arms, lever, and catch.

235. MACHINES FOR DIGGING POTATOES; George F. Tiffany, Palmyra, Michigan.

Claim—The hinged fork, in combination with the plough, arranged as set forth.

[In front of the cart body an adjustable plough is placed, constructed with closed sides, and operating by means of a wheel placed in front of it, so as to be self-adjusting while passing over the potato hills, adapting itself to the various depths of hills, and ploughing up the potatoes and sending them on to an endless riddle, where the dirt is cleaned off them.

236. MANUFACTURE OF GAS; Charles N. Tyler, Washington City, D. C.

Claim—Combining hydrogen gas with the volatile and easily condensible products of coal, resin, tar, &c., in their nascent state, in the manner set forth.

237. CULTIVATORS; Franklin Veal, Hallettsville, Texas.

Claim—Arranging the dovetailed projection at equal distances from the cutting edges of the shares, in combination with the slots and recesses in the arms, and for the purpose of securing the shares to the arms, and to render them reversible.

[This cultivator is especially adapted for hilling and weeding young crops of cotton, corn, or root crops, as it runs between two rows, throwing up the ground on each side, or it straddles two rows by a proper adjustment of the shares.]

238. SCREW PROPELLER; Jules Jean Baptiste Vergne, Paris, France.

Claim—The arrangement of the grooving fluting or ribs in the form of a series of steps, as described.

239. FLUID LAMPS; Anton Von Schuttenback, St. Petersburgh, Russia; patented in England, Oct. 11, 1858.

Claim—The combination of the gas-holder or gasometer, the vessel, the pipe, x, with its branches, the pipe, F, the chamber, the chimney, the oil reservoir, and the burner, the whole being applied as specified.

240. GAS RETORTS; Edward Walcott, Providence, Rhode Island.

Claim—1st, The combination with the lid of the projecting incline plane, as described. 2d, The employ-

ment for securing the lid of the mouth-piece of the retort in place of a horizontal eccentric or cam and lever, attached to, and combined with, a cross-bar, and applied to the mouth-piece of the retort, as described.

241. RAILROAD CAR SEATS; F. F. Wagner and P. P. Dickinson, Harrisburgh, Pennsylvania.

Claim—The arrangement and combination of the wheels, arms, cushions, and bars, as described.

[This invention consists in arranging on each side of the seat two cushions which fold one on the top of the other, and which are attached to arms that are connected by a series of gear wheels in such a manner that the cushions attached to one side of the seat are always situated on a plane parallel to the plane which passes through the cushions on the other side, so that when the cushions on one side are used for the back of the seat, those on the other form leg rests, and vice-versa, and by bringing the cushions in a horizontal position the seats are changed into sleeping couches.]

242. BODY BOLSTERS FOR RAILWAY CARS; Ambrose Ward, Altoona, Pennsylvania.

Claim—1st, The arrangement and combination of the trusses, centre plate, D, sills, and tension rods, as described. 2d, Providing the centre plate, D, with lugs, protecting flanch, or cap, lateral bearing flanch at the centre fitting into cup in plate, B, the vertical bearing flanch fitting into the cup or groove in plate, B, arranged as described.

[The centre plates are so arranged that the lateral friction between the upper and lower centre plate is reduced to a very small diameter, and sufficient room is obtained for circulating the oil or lubricating matter, and at the same time the dirt is excluded by means of a flanch attached to the upper plate and fitting over the lower one, and struts are cast to the upper centre plate in such a manner that they form steps for the truss timbers, and the downward pressure on either side of the car is sustained by the outer rings of the centre plates.]

243. METHOD OF OPENING AND CLOSING FARM GATES; David Warren, Gettysburgh, Pennsylvania.

Claim—The arrangement of the lever and bar, d, with the bar, E, and falling catch, constructed in the manner described.

244. CULTIVATORS; Henry Wells, Walnut Grove, Illinois.

Claim—The arrangement of the share, mould-boards, rods, H H and I I, the latter having the parts, d d, formed on them, the said parts passing respectively through the bar and beam, thus making a very firm structure, in the manner set forth.

245. TRACE FASTENER; Solon R. Atkins and D. H. Hull, Assignors to D. H. Hull, Plantsville, Connecticut.

Claim—The metallic box, having a semicircular ring on its end, and provided with a slide which is to be operated by a knob, and held against the neck of the button on the whiffle-tree by springs, arranged in the manner set forth.

246. DEVICE FOR FEEDING BEES; Wm. Brown, Assignor to self and Fontain G. Robertson, Shelbyville, Ind

Claim—The bottle-stopper, consisting of the cork, tube, and cup, secured together by the screw and nut, as described.

247. HEELS FOR BOOTS AND SHOES; Walter Hunt, City of New York.

Claim—Making the external form of the heels of boots and shoes of a metallic shell with an inner flanch at the upper edge, to fit over the usual heel seat of the sole and between that and the counter or back portion of the upper, and to be provided with an inner core, and the whole to be secured to the heel seat. Also, in combination with the shell, and upper flanch, and inner core, making the said shell with an inner flanch at the lower edge. Also, in combination with a heel, constructed as above described, and consisting of the shell with the upper and lower flanches and the enclosed core, the employment of a rotating top lift, as specified.

248. WATER GAUGES FOR STEAM BOILERS; Robert H. Mathies, Boston, Assignor to A. N. Clark, Beverly, Mass.

Claim—The combination, with the partition that separates the upper and lower main tubes, of the gauge of the independent steam and water tubes or courses, arranged to unite the spaces in the main tube, as specified.

249. DOUBLE CANNON FOR CHAIN SHOT; Wm. M. Jeffers, Assignor to self and Wm. L. Gibson, Elmira, N. Y.

Claim—The use of a partition intermediate between the breech and muzzle of the piece, in combination with the slot, so arranged that the charge of the barrels shall mingle at the fuse, so that immediately on the ignition thereof the expansive force shall be wholly expended in projecting the two balls, and not weakened by a continuous connexion between the barrels.

250. WATER GAUGES FOR STEAM BOILERS; H. K. Moore, Malden, Assignor to A. W. Adams and G. W. Dane, Boston, and Wm. G. Howe, Haverhill, Massachusetts.

I do not claim the single balanced valve apparatus, constructed with the arrangement of steam-receiving and discharging chambers, hollow stem or passage, external steam passage, and parts, d d. But I

Claim—Combining therewith the auxiliary steam space, and the nipple or raised valve seats, arranged as specified.

251. CHEESE COVER; E. L. Pratt, Assignor to self and R. B. Fitts, Philadelphia, Pennsylvania.

Claim—As an improved article of manufacture, for the purposes described, a ventilating cover constructed of tin plate, or other suitable material, so as to protect articles placed therein from the rays of light and heat, and the ravages of animals or insects, and at the same time secure perfect ventilation, by means of a series of small perforations at or near the base or bottom for the inlet of cool air, and another series of perforations at or near the top for the escape of warm air moisture and gases.

252. RAILROAD TURN-TABLES; Archibald and James H. Putnam, Assignors to selves and Philip S. Geisse, Wellsville, Ohio.

Claim—The adjustable spindle, applied and adapted in the manner set forth.

253. LOCK GUARD; Lawrence Schroder, Assignor to John H. Schroder & Co., Cincinnati, Ohio.

Claim—The arrangement of the several tumblers, in combination with intervening springs, which vary the spaces between said tumblers and operate the lock, in the manner set forth.

254. GAS RETORTS; John W. Smith, Washington City, D. C., Assignor to self and Jesse H. Whitehurst, Baltimore, Maryland.

Claim—The described arrangement of the pipes, e and e′, when combined with the retort and condensing chamber, in the manner set forth.

255. SMELTING FURNACE FOR IRON; Robert Wm. Sievier, Upper Holloway, Middlesex Co., England, Assignor to Wm. Lilley, Ohio.

Claim—The use of the exhaust pipe in connexion with a fan pump, or other means, to exhaust the foul

air and gases, and cause a current of air to pass through the bottom or apertures of the furnace of sufficient density for the smelting and purifying iron and other ores, in the manner set forth. Also, the exhaust fan, constructed and operating as explained. Further, the use of the movable crucible, as described.

256. EDGE PLANE FOR BOOTS AND SHOES; Benjamin Tolman, Assignor to self and Asa F. Ramsdell, Pembroke, Massachusetts.

Claim—The improved edge plane, as constructed, with cutter and gauge bearings, flanches, and confining devices arranged on the stock, and with respect to the cutter and gauge, as specified.

257. PATTERNS FOR CASTING STOVE COVERS; Charles Teuesdale and A. J. Sennett, Assignors to Wm. and Jacob Resor, Cincinnati, Ohio.

Claim—Constructing patterns for stove covers and centres, with an opening in their under sides, by means of which a draw bar may be withdrawn from the mould before removing the pattern, and also with a perforation, as set forth.

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258. CONSTRUCTING RIMS AND FIELD-PIECES FOR WATCH AND LOCKET CASES; J. N. Allen, Providence, R. I.

Claim—Making the rim and field-piece for watch or locket cases from a strip of sheet metal, as described.

259. VAPOR LAMP BURNERS; C. M. Alexander, New Albany, Indiana.

Claim—The combination of a retort having converging sides, and constructed in the manner set forth, with an inlet pipe and an outlet pipe, and a burner, for the purpose of forming a gas generating apparatus, to be used in connexion with fluid lamps.

260. SEEDING MACHINES; J. C. Bean, Grayville, Illinois.

Claim—The arrangement of the hopper and arms, in combination with the inclined equalizer, as set forth.

261. GAS RETORTS; William Beaumont, Paterson, New Jersey.

Claim—Making all that part of a retort which is most subject to expansion and contraction, corrugated to prevent fracture.

262. CONTRIVANCE BY WHICH THE WORKMAN OPERATES SCROLL SAWS; Edward Beck, Allentown, Pennsylvania.

Claim—The oscillating platform connected with the shaft by means of the straps and pulley, or their equivalents, the arm, pitman, and spring, arranged for joint operation as set forth.

263. RAILROAD BARS OR RAILS; Henry Betts, Hamilton, C. W.

Claim—The angle rail, in combination with the outside bar, where the space between them is filled in with cement, prepared by boiling sand and coal tar, in such proportions as will best resist the action of the elements, cold, heat, and moisture, and the wear of the wheels.

264. FIRE-PROOF DESK; M. B. Bigelow and Anson Hardy, Boston, Massachusetts.

Claim—The movable table, or any device essentially the same, in combination with the fire-proof case, said table being constructed and made so as to operate in the manner specified. Also, the slide, or any device essentially the same, in combination with the movable table and the fire-proof case, for supporting or assisting to support said movable table, whenever said table is drawn out to the position shown in fig. 2, said slide and table being connected and made so as to operate in the manner specified. Also, the brackets, or any device substantially the same, in combination with the fire-proof case for supporting, or assisting to support, the movable table and the slide, in the manner explained.

265. SPRING HINGE; Nelson Birdsall, Port Jervis, New York.

Claim—The combination and arrangement of the spring and adjusting piece applied to a hinge, as described. Also, inserting within the spiral spring the tubular spring, as described, for assisting the action of the spiral spring, and preventing it from setting or getting out of place with the other parts.

266. PLOUGHS; L. E. Burdin, Paris, Kentucky.

Claim—The arrangement of the beam, the handles, the standard, brace, H, share, landside, cone, spindle, or shaft, braces, C and G, and lug, as described.

267. CORN PLANTERS; Alexander, William, and James Campbell, Harrison, Ohio.

Claim—The described arrangement of the inclined slides or valves, levers, adjustable rods, and cam wheel.

268. JOB AND CARD PRINTING PRESS; J. A. Campbell, New Orleans, Louisiana.

Claim—Fastening the cylinder permanently on its solid axle, and also fastening the ends of this axle securely into the slides. Also, in combination with the cylinder, the revolving of the roller frame on the solid axle as its working centre, while the axle itself does not revolve either by eccentric wheels, which are to be used when the cylinder vibrates, or by plain ones when it is stationary. Also, the eccentric wheels, in combination with the cylinder. Also, the cranks, R, and connecting rods, D, in combination with the cylinder, the inking frame, and the eccentric wheels. Also, the combination of the cranks, S, the connecting rods, T, the slots, the pins, and the bottoms, with this press, as specified.

269. STOVES; W. J. Cantelo, Burlington, New Jersey.

Claim—The exterior casing and inner adjustable casing, in combination with the fire-pot and cone-shaped grate, when the several parts are arranged as set forth.

270. MACHINES FOR HOISTING BRICKS; T. F. Christman, Wilson, North Carolina.

Claim—The combination of the rollers, D D, with the saddle and buckets, E F, supported by rollers, J J, as set forth.

271. SEED PLANTERS; Giles Cramton, Marshall, Michigan.

Claim—The application and use of the pulleys, in combination with the adjustable hanger, tension bar, lever, and yoke, with its attached spring stops, arranged as specified.

272. MACHINES FOR SOWING FERTILIZERS IN DRILLS; C. B. Davis, Lawrenceburgh, Tennessee.

Claim—The arrangement of the hopper, wheels, frame, handles, D D, shoe, E, handle of shoe, H, pins on wheel, and axle-trees, as described.

273. APPARATUS FOR PURIFYING GAS; Aurelius Dickinson, Claremont, New Hampshire.

Claim—The washer, constructed with horizontal plates, corrugated or with the bottoms partly or wholly concave, and with upright plates projecting above and below the said plates, and dipping into the water below the said plates, and with orifices so arranged in the highest portions of the said horizontal plate, as to cause the collection of the gas in the concave portions of the said plates, below and around said orifices.

274. BASES FOR ARTIFICIAL TEETH; George Dieffenbach, City of New York.

Claim—The composition of matter consisting of sulphate of alumina, and other ingredients, substantially as described.

275. PROCESS FOR COLORING ARTIFICIAL TEETH; George Dieffenbach, City of New York.

Claim—Developing the color of a cured or hardened composition, by the agency of solar light, when the coloring matter is incorporated into the said composition, while in its plastic or uncured state.

276. CONNECTING BOARDS FOR ROOFS, &c.; Wm. T. DeGolyer, Schenectady, New York.

Claim—Covering the joints of board or plank for roofing, by means of sheets of metal bent in the form shown, so that the stripe of wood, or other packing used, shall lie on as well as against the flanches turned on said metal.

277. FURNACES; J. H. Duhme, Cincinnati, Ohio.

Claim—The arrangement of the flue spaces controlled by dampers, for the purpose of increasing and perfecting the combustion, as set forth.

278. CARTRIDGES; J. H. Ferguson, Baltimore, Maryland.

Claim—A water-proof and inflammable cartridge, made as described.

279. HARVESTING MACHINES; B. G. Fitzhugh, Frederick, Maryland.

Claim—The combination of a rake and reel revolving on the same shaft, when the rake is so made as to deliver the cut material in a line oblique to the swath of the machine.

280. GRAIN CRADLES; M. R. Flanders, Parishville, New York.

Claim—Attaching the finger standard to the swath by means of the rod and eye, secured respectively to the standard and snath in connexion with the compensating or adjustable braces, arranged as set forth.

281. GAS PURIFIERS; Peter Fontain, Philadelphia, Pennsylvania.

Claim—The receptacle or receiver, in combination with the filtering and purifying apparatus, arranged as described.

282. RECIPROCATING PROPELLER; John Galt, Philadelphia, Pennsylvania.

Claim—Combining the buckets with the frames and with the driving rods, or their equivalents, by means of cross-heads, link connexions, and slots, substantially as specified. Also, the construction of the propellers with the frames of flaring form, and with their buckets fitted to the smaller front portions thereof. Also, constructing the driving rods, each in two parts, one of which connected with the buckets, is capable of being connected with, or disconnected from, the other at pleasure, for the purpose either of closing the buckets before the backward movement, and opening them before the forward movement of the propeller frame commences, or of causing the closing of the buckets before the forward, and the opening of them before the backward movement, as may be desired, and thereby enabling the action of the propeller to be reversed, without reversing the engine.

283. LET-OFF MOTION FOR LOOMS; Wm. H. Gray, Dover, New Hampshire.

Claim—The board or plate and springs, applied to the breast beam of the loom, and combined with a clutch by which the yarn-beam can be thrown into gear with the cam shaft or crank shaft of the loom, to operate substantially as described.

284. ROTARY HARROWS; Christian and J. K. Gingrich, Annville, Pennsylvania.

Claim—The clearers, in combination with roller and ring, when arranged as set forth.

[Clearers are arranged upon the weighted arm of a rotating harrow, so as to precede the traveler or friction roller which supports the weight, and keep the annular ring upon which the traveler rolls clear of dirt in using the harrow, and an adjustable draft bar is added to place the line of draft in any position that may be desirable.]

285. RAKING ATTACHMENT FOR HARVESTERS; C. P. Gronberg, Montgomery, Illinois.

Claim—The peculiar arrangement of the mechanism, namely, the reciprocating rack bar and semicircular toothed bar, in connexion with the bent rack shaft, provided with a spring, arm, and part pinion, and the semicircular bar on the support provided with teeth and a projecting arm for joint operation, as set forth.

286. ALCOHOMETERS; Heinrich Guth, City of New York.

Claim—An alcohol indicator, substantially as described, by which the evaporation of a fixed quantity of alcoholic liquid is made to indicate the exact per centage of alcohol contained in the said liquid.

287. MACHINE FOR MAKING UPHOLSTERY SPRINGS; James Harrison, Jr., City of New York.

Claim—1st, Giving one or more of the forming rollers a positive rotary motion at a velocity which causes its or their periphery or peripheries to move faster than the periphery of that part of the mandrel in conjunction with it or them at any time in the operation. 2d, Connecting the axle of the roller, or any of the forming rollers, by a link and two universal joints, with a shaft having a longitudinally sliding and also a rotary motion, for the purpose of giving the said roller a rotary motion and a motion along the mandrel, and allowing it to accommodate its position to the varying diameter of the mandrel.

288. SHIP'S CAPSTANS; J. F. Holloway, Saline Mines, Illinois.

Claim—A capstan having a vertical movement as well as a rotary one, substantially in the manner specified.

289. STOVES; Marcus L. Horton, Lebanon, New Hampshire.

Claim—The ventilator with valve and hood, as arranged, and in combination with chambers and flues, operating as described.

290. APPARATUS FOR TANNING; D. L. Hubbard, Glastenbury, Connecticut.

Claim—The wheel or cylinder having its periphery formed of oblique slats placed within the vat, and arranged to operate as set forth. Further, in combination with the wheel or cylinder, constructed as described, the apron, for the purpose specified.

291. APPARATUS FOR CONDENSING COAL OILS; W. G. W. Jaeger, Baltimore, Maryland.

Claim—The employment of a fan-blower, when the same is used to draw the vapors from the retort, in the manner set forth. Also, in combination with the fan-blower or draft so used, I claim the escape pipe and trap, arranged as set forth.

292. BEDSTEAD FASTENING; J. C. Jeffries, Mount Vernon, Indiana.

Claim—The construction of a bedstead fastening formed with male and female plates, provided with tongues and hooks, when arranged in combination with a post and rail, in the manner as set forth.

293. ARRANGING COUCHES IN RAILROAD CARS; E. C. Knight, Philadelphia, Pennsylvania.

Claim—1st, The mode of arranging berths or couches over backs of railroad car seats, as set forth. 2d, The manner of supporting the backs of the seats by slides and rods, for the purpose described.

294. CROSS-CUT SAWING MACHINE; M. W. Knox, Sheridan, New York.

Claim—1st, The arrangement of the several parts of a sawing machine, as herein described, whereby the operator can manage the sawing, elevating, and depressing the saw, and opening and closing the clamp, without changing his position in relation to the machine. 2d, The guides and blocks, when arranged in combination with the saw, in the manner specified.

295. BRAIDING MACHINES; Isaac W. Lamb, West Novi, Michigan.

Claim—1st, The combination of the two sets of shuttle-carriers, rotating in opposite directions in concentric circles, and the shuttle-changers, having the movements described. 2d, The construction of the shuttles, each with two openings, and with a spring dog entering both openings, to operate in combination with the inclined surfaces and stops of the shuttle-carriers and shuttle-changers. 3d, The combination with the shuttles of the nippers, and their several appendages and appliances, by which their bite or friction upon the plaits are regulated and rendered uniform, substantially as described.

296. PRESERVE CANS; W. D. Ludlow, City of New York.

Claim—The described combination of the key with lugs attached, in the manner shown, to the sides of a cavity in the top of the can, in order to prevent the disruption of the said lugs during the act of closing the can, and avoid projections above or beyond its periphery.

297. MACHINE FOR FOLDING AND PACKING WOOL; Wm. H. Main, Liverpool, Ohio.

Claim—The devices for rolling the fleece into a compact cylindrical form, namely, the combination of the belt, rod, hooks, and pins, the same being operated by means of the windlass and screw, in the manner specified.

298. CULTIVATOR TEETH; Gardner Maynard, Ilion, New York.

Claim—The arrangement of the tooth, stay, and wrought iron stem and brace, when the stem is welded between the wings of the tooth and made to form a brace, as set forth.

299. PACKING FOR STUFFING-BOXES OF PISTONS; Charles M. Burney, Roxbury, Massachusetts.

Claim—A packing for stuffing-boxes composed of canvass and india rubber, as set forth, and cut diagonally, as described.

300. MACHINES FOR PULVERIZING MINERALS; Samuel and George E. Mills, City of New York.

Claim—A series of circular grooved and roughened metallic plates working upon their edges side by side in a trough or cylinder, the circle being larger than the plates, which have an alternating motion in combination with each other and the cylinder, and in connexion with the rock shafts and levers for operating the same.

301. MACHINE FOR FINISHING HAIR-BRUSH HANDLES; Thomas Mitchell, Lansingburg, New York.

Claim—The rotating cutter wheels, and guards, and guides, in combination with the clamps provided with patterns, arranged as set forth. Also, centering the unfinished brushes in the clamp by means of the bristles, in connexion with the strip or plate and the inner edge of the pattern or its extension, as described.

302. DEFECATING SUGAR JUICES; Marie Heloise Nicolas and Louise Josephine Champagne, Thibodeaux, La.

Claim—The employment in the bleaching and defecating of sugar juices, of the herein described combination of sulphur and lime, prepared in the manner set forth.

303. ANIMAL TRAP; Henry S. North and John O. Couch, Middletown, Connecticut.

Claim—1st, The combination of the many-chambered cylinder with the breech-pin, by means of a central counter-bore in the said cylinder, meeting the chambers, and a groove or recess all round the end of the breech-pin, whereby communication is made between the chambers of the cylinder, and all are enabled to be fired at once with a single vent. 2d, Fitting the hammer in the form of a ring to slide along the exterior of the breech-pin. 3d, The combination with the hammer applied to slide along the exterior of the hollow breech-pin, of a rod sliding through the centre of the cylinder and within the breech-pin, and a spring sear attached to the said rod, and working through a slot in the breech-pin, as described. 4th, The combination with the hammer applied outside of the hollow breech-pin of a collar, or its equivalent, applied within the breech-pin, and having pins or ears projecting through slots in the sides of the breech-pin behind the hammer, and a helical spring applied within the breech-pin, behind the said collar, or equivalent. 5th, The extension of the central rod which carries the sear directly through the cylinder and through the hollow breech-pin, so that it may be operated either by a pull at its front end or by a push at its rear end. 6th, In combination with the many-chambered cylinder, hollow breech-pin, hammer, central rod, sear, and spring, and collar, as described, we claim the stock and trigger, applied as described, to make a weapon that can be baited and set for shooting game, by the seizure of the bait, or that can be used in the hand like an ordinary pistol or fire arm.

304. TOOL-HOLDERS FOR LATHES; Charles Peck, New Haven, Connecticut.

Claim—1st, The combination of the tool-rest with the segment, or their mechanical equivalents, so as to elevate or depress the cutting instrument, when arranged in the manner described. 2d, The T-slotted bed-plate with the tool-rest connecting the tool-posts, when combined in the manner described, so as to allow the cutting tool to be placed at any required angle horizontally.

305. CLOTHES DRYER; George Race, Norwich, New York.

Claim—1st, The employment of a hollow post enclosing the arms of the reel, in which the arms may be elevated and depressed through its top, in the manner set forth. 2d, The combination of the sliding head and the arms hinged to said head at their lower extremities, and connected by cords, or other equivalent connexion, at their upper extremities, as described. 3d, The combination with the foregoing of the cord and

pulleys, the pinion, rack, and latch, for elevating and securing the head in the hollow post, when constructed in the manner set forth.

306. MACHINE FOR DRIVING HOOPS ON PAILS, &c.; Wm. Raymond, Marlboro', New Hampshire.

Claim—The employment of a driver, when either fixed or turning loosely in its bearings, and operated by means of a jointed lever, or otherwise, so as to press against and drive the hoop upon the tub, when a rotary motion is given to said tub.

307. COOKING RANGES; Wm. Resor, Cincinnati, Ohio.

Claim—The peculiar construction of the plate which constitutes the upper plate of the stove, forming, as it does, the plate of the stove, the arched roof of the damper chamber, and part of the chimney pipe, in the manner set forth.

308. MODE OF LIFTING STAMPS FOR CRUSHING ORES; Delos E. Rice, Detroit, Michigan.

Claim—The application of the folding wedges, in combination with the band, or their equivalents, thereby producing a uniform lift of the rods together with the stamp heads.

309. MACHINE FOR TURNING HUBS; Alex. Rickert, Schoharie, New York.

Claim—1st, The graduated scale, in combination with the index, and the sliding frame, and hub blank, and mandrel, operating in connexion with the cutters, in the manner described. 2d, The constructing the sliding sleeve with an opening at the angle so as to slide over and upon the large cutter on the shaft, so as to cut any required size of hub without change of knife, as described. Also, the constructing the sliding sleeve (or cutter and stock,) to pass over and mask the fixed knife on the shaft, in connexion and combination with the making one of the sides of the sleeve thicker and heavier than the other, in order to approximate to an equipoise of the shaft. 3d, The setting and adjusting (by means of the slot and screw-bolt) the arm, so as to cut any required length of hub, and so arranged upon the bar as to allow it to vibrate, for the purpose of bringing up the cutters to the hub or throwing them back when required, and without interfering with the screw or the adjustment of the arm.

310. COTTON CULTIVATORS; Wm. J. Rivers, Sumter District, South Carolina.

Claim—The handles, helve, beam, foot bar, plough, harrow, roller frame, and roller, when arranged for joint operation as described.

311. APPARATUS FOR HEATING, COOKING, AND VENTILATING; C. B. Sawyer, Fitchburgh, Massachusetts.

Claim—The combination of the oven and range with the fire-pot, fire-flues, and air-pipes, as described.

312. BROOM CLASP; P. B. Sheldon, Prattsburgh, Assignor to self and J. T. Upson, Huron, New York.

Claim—The feathers or ribs, in combination with the screw-threads of the shanks and with the handle, as described. Also, the combination of the conical screw shanks, conical screw ferrule, and screw-bolts, and nuts, arranged as set forth. Also, the wires attached to the jaws and arranged in combination therewith, in the manner described.

313. CORN SHELLERS; Adon Siddall, Ramson, Michigan.

Claim—The arrangement of the stirrup with the levers for operating the adjustable sliding pressure bar, in the manner described.

314. POWER-PULLEY PRESSES; William and Robert Skene, Louisville, Kentucky.

Claim—1st, The arrangement of the scroll and the conical windlasses, E E′, to operate in combination with the windlass, H, and with the two followers, or their equivalents, as specified. 2d, Arranging the scroll and the windlasses, E E′, or their equivalents, on slides, which are rigidly attached to the upper follower, so that the weight of those parts assists in increasing the pressure on the substance placed between the two followers. 3d, The arrangement of the two followers with pulleys to operate, in combination with the scroll, the cone windlasses, and the ropes, substantially as set forth.

315. POWER GEAR PRESSES; William and Robert Skene, Louisville, Kentucky.

Claim—The arrangement of the windlasses, the weight, the scroll, and the pinion, H, to operate in combination with the cog-wheel, the pinions, E and E′, the double rack, and the follower, substantially as specified.

316. CARPET FASTENER; M. D. and S. A. Snyder, Clarendon, New York.

Claim—An improved carpet hook, consisting of the barbed shank, gauge notch, throat, and rectangular clinching hook, constructed in the manner described.

317. RETORTS FOR DISTILLATION OF COAL; John L. Stewart, East Boston, Massachusetts.

Claim—My improved revolving web retort, constructed not only with its induction and eduction openings arranged at or near one end of it, but with an endless, or other proper carrier, made so as to operate to receive the coal or matter to be distilled from or near one end of the retort, and carry or force the same toward the opposite end thereof, and from thence backward toward the front end, and there discharge such, the same causing the coal or matter to be distilled to pass twice through the retort or carbonizing chamber, in manner and for securing advantages specified. And, furthermore, in combination with the retort or its discharging mouth, a water-sealing trough and an endless carrier to operate in such trough, substantially as specified, to receive or carry away from the retort the discharged coke or products, the water of the trough, under such application of it to the discharging mouth, serving to furnish vapor or steam to the retort in manner, and to effect an advantage in the distillation of the coal or matter therein, as specified.

318. MACHINES FOR MAKING HAY; J. C. Stoddard, Worcester, Massachusetts.

Claim—Arranging the rakes in radial slots between the two drum-heads, and fixing them therein, so as to serve the purpose of a hay-making, and by a single change, a hay-raking machine, in the manner set forth.

319. APPARATUS FOR DRYING GRAIN; Joseph Souter, Chicago, Illinois.

Claim—The drying of grain by means of heated air within a vertical cylindrical chamber, which is provided with a series of tapering rims and a central shaft, which is armed with a series of winged scattering wheels, when a fan, or some other equivalent means, is employed for producing an upward current of heated air through the said chamber, in the manner set forth.

320. APPARATUS FOR HEATING BUILDINGS; George S. G. Spence, Boston, Massachusetts.

Claim—The arrangement of the elevated sides of the boiler, in combination with the pipe, or its equivalent, depressed within the same for heating and distributing the air, in the manner set forth.

321. HARVESTING MACHINES; A. G. Stipher, Richmond, Indiana.

Claim—1st, The employment or use of the tilting spring rake, in combination with the sliding raker frame, arranged as set forth. 2d, Operating the raker frame and raker, by means of the reciprocating bar, through the medium of the rack, cog-wheel, pulley, and cord, arranged as set forth. 3d The combination with the raker, the sliding trap-doors, operated by means of the bent levers, springs, and cams, as set forth.

322. DEFECATING SUGAR JUICES; A. A. Tait, Assignor to George B. Hartson, City of New York.

Claim—The employment of the sulphate of tin, applied in manner substantially as described, for defecating cane juice and syrups.

323. FRAMES FOR MANUFACTURE OF SOAP; R. P. Thomas, Syracuse, New York.

Claim—Lining soap frames in ordinary use with flexible metallic plates, in the manner set forth.

324. CORN PLANTERS; C. G. Udell, Morris, Illinois.

Claim—1st, The arrangement of the grain box, tubes, connecting bars, and legs, constructed in the manner set forth. 2d, In combination with the above, I claim the measure, marking rod, and guide, constructed in the manner set forth.

325. MACHINE FOR HULLING AND SCOURING GRAIN; T. F. Wagoner, Trenton, New Jersey.

Claim—The combination of two surfaces, one of which is elastic and the other hard, when the planes of said surfaces are placed on a plane with the horizon, and one of them having a circular motion for the purpose of hulling and scouring grain, as set forth.

326. HORSE-SHOE MACHINE; H. L. Watts, Chester, Massachusetts.

Claim—The arrangement and combination of the slotted carriage, the die, the followers, the rollers, as described.

327. ROTARY CULTIVATORS; John Young, Joliet, Illinois.

Claim—The arrangement and combination of the skeleton or open rotary ploughing cylinder, when the mould-boards thereof are set tangential, and extend from end to end of the cylinder in a straight or oblique direction, in combination with a rotary shaft or circular edge discs, the whole being operated as set forth.

328. HARVESTING MACHINES; McClintock Young, Jr., Frederick, Maryland.

Claim—Combining the handle of the rake with the shaft by means of the supporter, the shaft arm, the crank, the pitman, h, and the pitman, i, and in such a manner that the rotation of said shaft will steadily and positively impart the desired movements to the rake. Also, the combination of the cams and the guides, or either of them, with the above described mechanism for operating the rake, constructed in the manner described.

329. FURNACES; E. B. Cherevy, Assignor to self and T. W. Weathered, City of New York.

Claim—The hollow dome, k, over the fire, in combination with the dome, h, in the manner and for the purposes specified, whereby the heat ascends into said dome, k, and then passes away between the domes, h and k, heating the circulating water, as specified. Also, the thimbles passing through the flanches and forming openings for the circulating water, as specified.

330. MODE OF IMPARTING MOMENTUM MOTION TO A SIFTING APPARATUS; Samuel Clark, Assignor to W. O. Bourne, City of New York.

Claim—1st, The imparting a short, quick, or jarring motion to a sifting apparatus, or machinery of any kind, where such motion is desirable, by means of an oscillating, vibrating, or reciprocating weight, brought, at the end of its motion, into contact with the said apparatus or its attachments, in the manner described, or its equivalent. 2d, Suspending the object to which the motion is applied by means of a suspending or supporting link or rod, with concave bearing parts uppermost at both ends and convex bearing parts undermost, constructed as above set forth, or in an equivalent manner.

331. SEEDING MACHINES; Daniel Foreman, Assignor to self, G. W. Sweringen, and Jonathan Penoyer, Navarre, Ohio.

Claim—The arrangement and combination with the interior of the peculiarly formed hollow slide of the adjustable plate, as described.

332. LET-OFF MOTION FOR LOOMS; W. H. Gray, Dover, New Hampshire, Assignor to self and Luther Robinson, Melrose, Massachusetts.

Claim—1st, Combining the clutch, or its equivalent, by which motion is imparted to the let-off mechanism, with the yarn-beam, by means of a worm-gear on the yarn-beam, and an endless screw and spring, applied, substantially as described, to the shaft which controls the rotation of the beam, and operating as set forth. 2d, In combination with the worm-gear, endless screw, and spring, applied as described, I claim the lever applied between the said spring and the surface of the yarn on the beam, and operating as specified.

333. PORTABLE DOOR FASTENER; Levi C. Johnson, Assignor to self and J. B. Smith, Buffalo, New York.

Claim—The sliding bar (including the plate, F), when so constructed as to form the slot, and so connected and arranged with the plates, A and A′, and bolt, B, as that when placed in the door for use, the bar will stand at right-angles with the bolt, and when folded for carrying in the pocket, the plate, F, will cover the teeth or spurs of plate, A, as described.

334. METHOD OF PROTECTING IRON FROM OXIDATION; E. G. Pomroy, City of New York, Assignor to J. R. Pomroy, Brooklyn, New York.

Claim—The preparation of iron by corroding or oxidizing its surface, for the express purpose of making the same rough and capable of being closely and firmly united with a covering of fire-proof paint, by means of rolling, or other mechanical force, and the application of the other processes above described to iron so prepared, in combination therewith.

335. GRAIN SEPARATORS; Austin Potter, Assignor to self and J. W. Norton, Williamson, New York.

Claim—The application of the adjustable slide-board to the endless riddle, in such a manner that the grain and straw can be made to impinge upon the end or more open meshes of the same, or upon the top, thereby varying and adapting the action to the quality of grain and straw, and employing the force with which it leaves the cylinder as a means of separating the two. Also, the combination and arrangement of the parts, consisting of the fan, self-vibrating riddle, with pulleys driven directly from the cylinder, elongated shaker and board, and intermediate adjustable slide-board, operating conjointly to form a more portable, cheap, and effective separating attachment to threshing machines.

336. APPARATUS FOR OILING CYLINDERS AND THE PISTONS OF STEAM ENGINES; C. A. Stebbens, Assignor to self and R. J. Todd, Boston, Massachusetts.

Claim—The combination of the lifter and tubular holder, or their equivalent or equivalents, with the valve and the piston, the whole being constructed and applied together, and to a reservoir and its pump barrel, in the manner specified.

EXTENSION.

1. MACHINES FOR RAISING AND LOWERING WEIGHTS; Ephraim Morris, City of New York; patented July 5, 1845; extended June 28, 1859.

Claim—The manner of combining the barrel discs with the wheel, for the purpose of hoisting, lowering, or suspending weights by means of the ribs and grooves, or any analogous device. And the further combination therewith of the means employed to govern and regulate the action of said parts, namely, the friction bands and levers, the attaching or detaching lever, rolling shaft and bit, pin and slide-key, substantially as such manner and combination are shown, irrespective of the power employed to work the machinery, and also irrespective of the mode by which power is connected to the working parts.

ADDITIONAL IMPROVEMENT.

1. THE CONSTRUCTION OF CHAIRS, SOFAS, &c.; Charles Robinson, Cambridgeport, Massachusetts; patented March 9, 1858; additional dated June 14, 1859.

Claim—Additional to the original improvement, the spring plate, arranged and operating in combination with the supporting blocks, as specified.

2. RAILROAD CAR SPRINGS; A. B. Davis, Philadelphia, Pennsylvania; patented February 15, 1859; additional dated June 28, 1859.

Claim—The bore and cover plate secured together by a bolt, or other suitable fastening, in combination with one or more loose plates placed within the box, so as to divide the latter into two or more compartments.

RE-ISSUES.

1. COTTON GINS; David G. Olmstead, Vicksburg, Mississippi, Assignee of R. A. L. McCurdy, Sabine Parish, Louisiana; patented June 26, 1855; re-issued July 15, 1856; re-re-issued June 14, 1859.

Claim—The revolving screen, cylinder, or shaft situated in the hopper or roll-box, so that the roll moves around it, when arranged in the manner described, whether as a single or double device, so as to perform any or all of the functions. Also, discharging the hulls and trash from the roll-box through the sides of the cotton gin.

2. FASTENING CENTRE-BITS: Able W. Streeter, Shellburne Falls, Massachusetts; patented Jan. 23, 1855; re-issued June 14, 1859.

Claim—Fastening a bit in its stock by means of a projection on one, and a suitable recess for it on the other, when combined with mechanical pressure or friction that will hold the projection and recess together.

3. WATER-BACKS FOR RANGES; James Ingram, City of New York; patented February 16, 1858; re-issued June 21, 1859.

Claim—Protecting the water-backs of ranges by the introduction of a movable fire-brick, soap-stone, or equivalent material, between the fire and said water-backs. Also, arranging said water-back, as set forth, whereby the same can be moved away from the fire to allow space for introducing said protecting fire-brick, or its equivalent. And in combination with said water-brick, the lever and weight, or their equivalent, to move the intervening soap-stone or fire-brick.

4. BRIDGES; D. C. McCallum, Owego, New York; patented Jan. 20, 1857; re-issued June 21, 1859.

Claim—So combining the arch cord or beam, the arch brace, and the abutment or pier of a bridge, as that the thrust of the arch shall be thrown down upon the abutment or pier, and any deflexion in the lower cord be counteracted by an upward force at the upper ends of the arch braces. Also, the method of lengthening or shortening the braces of a bridge truss or girder, by which the truss may be elevated or depressed, as required, by means of the yoke, the plate on the end of the brace, and the straining pieces with their nuts, as described.

5. GOVERNORS FOR STEAM ENGINES; Charles T. Porter, City of New York; patented July 18, 1858; re-issued June 21, 1859.

Claim—1st, In combination with arms and very small balls, or their equivalents, revolving at a velocity several times greater than would be due or natural to them, considered as a conical pendulum, the employment of a counterpoise, applied as described, and so proportioned in weight as to balance, or nearly so, the centrifugal force developed by the revolution of the said arms and balls, or their equivalents. 2d, The employment, at the connexion between the arms and the central spindle of the governor, of a joint, constructed as described, whereby each arm is brought to the outside of the joint on one side, and made to thrust against the joint pin close to one end thereof at a right-angle, and at a distance from the axis of revolution.

6. VENEERS; John A. Jackson, Assignee of Israel Amies, Philadelphia, Pennsylvania; patented December 11, 1855; re-issued June 21, 1859.

Claim—The embossed veneers described, the same being adapted for subsequent application in the construction and ornamenting of furniture, and other articles, to which veneers are or may be applicable.

7. REAPING MACHINES; Obed Hussey, Baltimore, Maryland; patented Aug. 7, 1847; re-issued April 14, 1857; re-re-issued June 21, 1859.

Claim—The combination of side and cross bearings of the guards, with flush edges at or near the forks of the blades.

8. REAPING MACHINES; Obed Hussey, Baltimore, Maryland; patented Aug. 7, 1847; re-issued April 14, 1857; re-re-issued June 21, 1859.

Claim—Scalloped cutters with their blades beveled, as described.

9. PROCESS OF GRINDING PAPER PULP; Joseph Kingsland, Jr., Franklin, New Jersey; patented Dec. 23, 1856; re-issued June 28, 1859.

Claim—The process of reducing fibrous substances to pulp suitable for making paper, whilst such fibrous

substances are suspended in water, by subjecting them to the operation of grinding or beating action in a closed vessel, to which it is supplied by the hydraulic power of a descending column of water so charged with the fibrous substance, and permitting it to escape and be discharged so soon as it is sufficiently reduced. Also, separating the fibres from the mass so soon as they are sufficiently reduced, and discharging them by the hydrostatic pressure of the column of water in which the fibres are suspended, and which in flowing upward to the discharge carries with it only the fibres which are sufficiently reduced.

10. MACHINERY FOR GRINDING PAPER PULP; Joseph Kingsland Jr., Franklin, New Jersey; patented Dec. 16, 1856; re-issued June 28, 1859.

Claim—The combination of the rotating grinder with, and inclosed in, a surrounding case, which constitutes the opposing grinding surface, and which is provided with a feeding pipe and discharge aperture, suitable for feeding or carrying the fibrous substances to and from the grinder in the inclosed vessel, by the hydraulic pressure of a descending column of water.

11. BRICK MACHINES; Joseph W. Jayne, Sandusky, Ohio; patented May 5, 1857; re-issued June 28, 1859.

Claim—1st, The yoke, constructed in the form described, by which converging planes are held firmly in the same position relative to each other, whether the same be composed of one or more pieces of metal. 2d, The radial sliding and revolving chargers, in combination with the mould wheel. 3d, The arrangement of the guide stem on one side of the pressers instead of on the end, whereby I am enabled to place the pressing roller in the cavity of the piston. 4th, Making the piston or presser hollow, and inserting the pressing roller in the cavity thereof (instead of placing it upon a guide stem as heretofore done).

12. PROCESS OF MANUFACTURING WIRE GRATING, &c.; Henry Jenkins, Brooklyn, New York; patented March 6, 1847; re-issued June 28, 1859.

Claim—Manufacturing screws, or other articles, from metallic wires or bars that are bent or crinkled at the point of intersection previously to being laid or woven up, whereby I am enabled to form meshes of any desired size or shape by such intersecting bars or wires, so that they shall be rigid and durable, as set forth, and this I claim irrespective of the mechanism for bending or crinkling said wires, or interweaving them to form the requisite meshes.

13. WASHING MACHINES; Miner Van Auken, Saratoga Springs, New York; patented May 11, 1858; re-issued June 28, 1859.

Claim—1st, Providing a stop-board at the lower portion of the rear end of the rubber, as set forth. 2d, Providing an oblong slot, the lower termination of which is of scroll form, in each of the pendulous arms of the rubber, as set forth. 3d, The combination with said slot of a back trip-board, as set forth.

14. MACHINE FOR FINISHING BRUSH HANDLES; John Ames, Assignee of Thomas Mitchell, Lansingburgh, New York; patented June 23, 1857; re-issued June 28, 1859.

Claim—1st, The combination of the crown-wheel saw with the adjustable platform and stop, as set forth. 2d, The wheel, provided with the oblique cutters, in combination with the guard or gauge piece, the cutter wheel and gauge piece being arranged relatively with each other, substantially as set forth. 3d, The arrangement and combination of the platform with revolving cutters shaped and operating as described, crown-saw, with the arms and the adjustable platform and cutter wheels, with their cutters, as described.

15. VALVES FOR DRY GAS METRES; W. Hopper and R. H. Gratz, Assignees of C. C. Lloyd, Philadelphia, Pa.; patented June 22, 1858; re-issued June 28, 1859.

Claim—1st, The combination of the rotary valve with a series of brakes or edges, arranged so as to escape the upper surface of the valve seat. 2d, The drip and valve seat, arranged so as to collect and carry off any liquid deposit in the metre. 3d, The valve carriage, arranged substantially as described. 4th, The combination of the valve, the valve seat, the shafts attached to the diaphragms, arranged for the purpose of restraining a reverse movement in the metre, and thus dispensing with the click and ratchet.

16. ICE CREAM FREEZERS; H. B. Masser, Sunbury, Pennsylvania; patented Dec. 12, 1848; re-issued January 1, 1850; re-re-issued June 28, 1859.

Claim—A scraper or scrapers which act or bind during the process of freezing cream with a yielding spring force against the inner surface or surfaces of the cream chamber, as set forth.

DESIGNS.

1. SEWING MACHINES; Solomon B. Ellithorp, City of New York; dated June 7, 1859.
2. COOK STOVE; Anthony J. Gallagher and Jacob Beesley, Assignors to Anthony J. Gallagher, Philadelphia, Pennsylvania; dated June 7, 1859.
3. STOVE PLATES; S. W. Gibbs, Albany, New York, Assignor to Abbott & Lawrence, Philadelphia, Pennsylvania; dated June 14, 1859.
4. STOVE PLATES; S. W. Gibbs, Albany, New York, Assignor to Abbott & Lawrence, Philadelphia, Pennsylvania; dated June 14, 1859.
5. TOP AND BASES OF SHEET IRON STOVES; S. W. Gibbs, Assignor to Rathbone & Co., Albany, New York; dated June 14, 1859.
6. ARMS OF SEWING MACHINES; James S. McCurdy, Brooklyn, New York, Assignor to John M. Myers, City of New York; dated June 14, 1859.
7. MATCH-BOXES; P. J. Clark, Assignor to S. S. Clark, West Meriden, Connecticut; dated June 28, 1859.

JULY 5.

1. FURNITURE CASTER; Demas S. Barnes, City of New York.

Claim—The spherical roller with its axle running in the frame work, in combination with the two convex surfaces, or with the convex and concave surfaces, so as to enable the same readily to revolve on a vertical axis, the whole being constructed and enclosed in the tube or case, as described.

2. WATER-WHEEL; Benjamin Billings, Macedon, New York.

Claim—The conical crown and conical wheel, constructed in the manner specified.

3. Cotton Harvesters; Lewis Bishop, Talladega, Alabama.

Claim—The endless picker chains placed on the cylinder in connexion with the brush cylinder, the above parts being attached to a cart or to a box or receptacle mounted on wheels, as set forth.

4. Hook for Whiffle-trees; Snowball Botterill, Westmoreland, New York.

Claim—The combination and arrangement of hooks and spring button, in the manner set forth.

5. Wind Engine; Henry W. Bowen, Providence, Rhode Island.

Claim—The frame provided with sails and attached to the shaft, in connexion with the bent lever connected with the sails by the rods and arms, the links, spring rod, and the weight and spring, or their equivalents, arranged as set forth.

6. Washing Machine; Robert Brown, Stroudsburg, Pennsylvania.

Claim—The arrangement in the trough of the chambers and transverse strips with the bars, when the chambers stand behind the strips, and the strips are placed in such a relation to the bars that they will pass between them, and thus at the same time press and rub the clothes.

7. Harvesting Machines; Thomas B. Butler, Norwalk, Connecticut.

Claim—The employment of the cams and guides, for the purpose of giving a forward and backward motion to the cutter bar and cutters.

8. Method of Reducing Wood, &c., to Sawdust or Finer Grains; W. J. Cantelo, Burlington, New Jersey.

Claim—Reducing glutinous, fibrous, and other tough materials, to powder, by placing the ends of blocks of the same opposite to and in contact with each other, and presenting them simultaneously, and at the point of junction, to the edge of a circular or reciprocating saw, with the aid of the appliances described.

9. Machinery for Webbing Single Strands of Thread; Michel Celerier, Philadelphia, Pennsylvania.

Claim—The combination of the pulley, the sliding car, the fork, and the eye-piece, arranged as described, for preparing silk for making twist.

10. Wrought Nail Machine; Charles Clareni, City of New York.

Claim—The combination of the top and side hammers and vibratory anvil, so as to form two or more nails at a time without turning the rod. Also, the apparatus for connecting the driving shaft with the top hammer, by which it receives its motion in a proper manner. Also, the connexion of the side hammers with the driving shaft to produce the requisite motions thereof, and allow said hammers to be raised and lowered. Also, the arrangement and operation of the cutter, as described, for severing the nail from the rod.

11. Ploughs; Isaac Cook and John T. Bever, Haynesville, Missouri.

Claim—The combination and arrangement of the sharp-edged land side wheel with a reversible, double-pointed mould-board, which has no land side bars, as set forth.

12. Steam Engines; George H. Corliss, Providence, Rhode Island.

Claim—Imparting to the liberated slide valves of steam engines their closing movements by springs, so connected with the valve gear that whilst these springs impart the same initial force to the valves at every operation, the expansive force which these springs exert varies with every change in the range of movement given to the valves. Also, imparting to the liberated slide valves of steam engines their closing movements, by springs combined with a curved moving support, in such manner that the spring applies itself tangentially to the said support, and the effective length of the spring varies with the tensive force which it exerts.

13. Method of Opening and Closing Farm Gates; B. M. Dorr, Kenawee, Illinois.

Claim—The arrangement of the pinion, the toothed racks, and the levers, to operate in combination with the slotted rods, and the crank levers, for the purpose of opening and closing the gate.

14. Water-proof Paints; Epes E. and Joseph F. Ellery, City of New York.

Claim—The composition prepared and composed of the materials, as described, in the proportions set forth, for the purpose of making water-proof paint.

15. Mills for Crushing Cane; H. C. Emery, Lincoln, Ohio.

Claim—The adjustable shafts of the rollers in slide bearings, at top and bottom, operating them in a rectilinear frame in a direct manner for giving a wedge pressure, providing them near their top with flanches and a groove and a bevel on their bottoms, from the periphery toward the shafts, the several parts standing in the relation to each other, as specified.

16. Lamps; A. L. Fleury, Baltimore, Maryland.

Claim—1st, The quick-lime cones, or their equivalents, arranged as described. 2d, In combination with the above, the flanched cap, as described.

17. Machine for Finishing the Exterior of Rims of Carriage Wheels; Reuben Fretz, Montville, Ohio.

Claim—Combining in the arm that gauges the plane, devices for varying the height of the radial arm with the devices for varying its length, so as to enable the operator to dress a wheel straight or square across the edge. Also, making the arm or bar which guides the plane in the arc of a circle, to vibrate in the stock, so as to adjust and fasten it in the position desired.

18. Cut-off Gear for Steam Engines; P. W. Gates, D. R. Frazer, and T. Chalmers, Chicago, Illinois.

Claim—The combination of the two levers, D D′, and their dogs, the lever or levers, C, and its or their teeth, and the eccentric curved plate or plates, the whole applied to the stem or stems of the valve or valves, to operate as set forth. Also, in combination with the said levers, teeth, and dogs, and the eccentric curved plate or plates of the arm on the valve stem, and the spring or stationary curved surface, applied and operating as specified.

19. Machine for Cutting Ends of Billiard Cues True; Ira Glynn and Mikel Borowsky, Placerville, Cal.

Claim—The application of the reversed knife or cutter, and the spring jaws for holding the cue, so as it can be cut off square for the leather—these jaws will open or close to suit the size of the cues.

20. Printing Press; George P. Gordon, City of New York.

Claim—1st, Taking the sheet from the feed-board by grippers, or their equivalents, and presenting it directly to or upon the form of types, thence conveying it to the place of impression so that it may be printed. 2d, The combination of a reciprocating bed with a set of sheet-receiving grippers, so that the movements of the bed may control the action of the grippers, in order that the sheet may be taken from the place of feeding

to the place of printing by such grippers. 3d, The combination of a vibrating platen, having a stationary or fixed axis upon which to vibrate, with a reciprocating bed. 4th, The combination of a set of sheet-piling grippers which will peel or take the printed sheet from the face of the type and pile it on its place of deposit, with a reciprocating bed. 5th, By use of automatic grippers, piling the sheets directly before or in front of, and under the eye of the operator, so that he may at once detect any imperfection in the impression. 6th, The combination in one and the same machine of a set of grippers, to take the sheet and carry it to the place of printing, with another set of grippers to take the sheet from the form and pile it. 7th, The arrangement and construction of a chase, as described, in combination with the piling grippers. 8th, The giving a reciprocating vibratory motion to a bed or carriage, allowing the necessary intervals of time for the purpose of receiving the sheet or the impression, either or both of them, by means of the cam forming part of the bed, the cranked shaft, the vibrating arm, and the connecting rod, or their equivalents.

21. PADDLE-WHEEL; William Gorman, City of New York.

Claim—The sliding paddles or floats placed between the traverse bars of the arms of the wheel, and arranged with the catches and stationary cam, or their equivalents, to operate as set forth.

22. CORN HUSKERS; S. N. Gragg, Shelburne Falls, Massachusetts.

Claim—The curved or convex rest, in combination with the reciprocating knife, arranged as described.

23. SEWING MACHINES; William Grout, Worcester, Massachusetts.

Claim—1st, The arrangement of the feeding bar, needle, and looper, in the manner described, so that the movement of the cloth shall aid in extending the looper thread and in tightening the needle thread, and this when the needle is out of the cloth. 2d, The arrangement of the looper and forceps, so that the forceps shall draw the loop of the needle thread across the path of the looper, and in line with the movement of the cloth. 3d, The combination of the needle and looper, when arranged so that both shall reciprocate in straight lines, and also so that by merely changing the length of the looper a single or double stitch may be formed, in the manner described.

24. ABDOMINAL SUPPORTERS; Benjamin A. Grover, Momence, Illinois.

Claim—1st, Constructing an adjustable spring steel frame, of the form described, by combining, arranging, and securing together a series of spring bars, in the manner described. 2d, Covering the concave portion of said frame with a canvass, or other cloth, whose edge or border is gathered and drawn together over the outside edges of the said spring frame, by an india rubber or other elastic cord, so as to give the covering portion of said canvass, or other cloth, the character of an elastic cushion, no matter what may be the extent of the contraction or expansion of the spring frame. 3d, Attaching the upper and lower straps which respectively branch upward and downward from the band of the main strap at the points of the spring frame, and in the relation to each other and the centre or main straps, so as to give an upward pressure to the spring frame, and for other purposes set forth.

25. HORSE RAKES; Elijah Harris, Princeton, Illinois.

Claim—The levers with the arms and the projection or finger, in combination with the stop, as set forth.

26. DOOR FASTENING; W. Hartsfield, Thomaston, Georgia.

Claim—The arrangement of the bar which is attached to the inside of a door, to operate in combination with the staple, and with the bolt and spring, as described.

27. MACHINE FOR BORING; Henry Hays, City of New York.

Claim—The arrangement of the adjustable head blocks, carrying the spindles of the boring tools, when combined with the spring-tightening pulley, in the manner specified.

28. STOVES; John Henderson, Horseheads, New York.

Claim—The construction and arrangement of the ventilating passages and concealed flues, the former having their origin in the heating chamber, and terminating at or near the top of the oven, and the latter starting from the lower part thereof, and terminating in the flue, whereby external air is admitted, and currents thereof passed through the oven.

29. CONSTRUCTION OF SHEET METAL COFFINS; Isaac C. Shuler, Amsterdam, New York.

Claim—1st, The arrangement of stiffening the lower part of a sheet metal coffin by locking together the scrolled edges of the sides and bottom, forming a firm rim when they are soldered together. 2d, The sheet metal rim, c, on the outside of the walls, as a means of stiffening the base either with or without a filling of molten metal, according to the size of the coffin. 3d, The rim, d, of sheet metal, single or scrolled, forming an inside chamber, which may be filled with molten metal or left hollow, according to the size of the coffin. 4th, A cast metal rim, f, with a deep groove on the under side, which receives, straightens, and stiffens the walls, and which serves to support the lids. 5th, Setting the pillows or braces, x, at the corners and around the body of the coffin between the inward projections of the rims, d and f, which give them an extended purchase, for the purpose of stiffening the walls; also, the peculiar braces, K, to prevent the lateral racking of the bottom. 6th, The arrangement of pressing inverted beads or recesses, in any required number, in the sheet metal of the lid, walls, and bottom of a metal coffin on the inside and on the outside of the same, which may be filled with molten metal in the large size, and left empty in the small size coffins, for the purpose of securing, by a peculiar mode of manufacture, of a level surface between the indented parts described. 7th, The arrangement of fastening firmly on the under side, near the outer edge of the air-tight lid of a sheet metal coffin, a cast metal rim, or its equivalent, for the purpose of strengthening this lid, and also for fitting into the groove in the rim, F, on the upper edge of the walls of the coffin. 8th, The arrangement of fastening around the face-window on the under side of the air-tight lid of a sheet metal coffin, a cast metal sash or rim, m, which receives and supports the face-glass when it is cemented in its proper place. 9th, The arrangement of fastening permanently, on the under side near the outer edge of the sheet metal blind, m, which covers the glass in the face-window of a sheet metal coffin, a cast metal brim, o, or its equivalent, for the purpose of strengthening and furnishing a means of securing the same to the outer lid which covers the air-tight joint. 10th, The arrangement described of two entire, distinct, separate sheet metal lids.

30. BUTTER COOLER; G. W. Smith, Hartford, Connecticut.

Claim—The arrangement of the air-tight ice chamber, in combination with the butter-plate and with the cup, as set forth.

31. DEVICE FOR HEATING STEAM BOILERS; Daniel Hess, Uniontown, Iowa.

Claim—1st, The combination with a steam boiler of the tight external casing and fan, for the purpose of producing currents of air around the boiler. 2d, In combination with the subject of the first claim, the stove provided with a smoke-pipe through which the products of combustion pass, while the heat passes into the casing.

32. AUTOMATIC FAN; Hervey Hoffman, City of New York.

Claim—The arrangement of the rock shaft, arms, bells, and rollers, or the equivalents, to operate in combination with the fan-carrier.

33. RAILROAD CHAIRS; Isaac B. Howe, Northfield, Vermont.

Claim—The one-lip chair, secured by the single bolt, in combination with the permanent fishing piece, arranged and operating in the manner set forth.

34. MANUFACTURING WADDING; Julius C. Hurd and Moses A. Johnson, Dorchester, Massachusetts.

Claim—The described wadding, having its two surfaces felted, as set forth.

35. MOWING MACHINES; Obed Hussey, Baltimore, Maryland.

Claim—In combination with the ordinary apparatus fixed to the extreme end of the finger beam, and called a track clearer, a similar apparatus at the opposite or frame end of said beam, when so arranged as to sweep the cut grass towards the centre of the swath, and leave it in a windrow behind the machine.

36. MACHINE FOR TURNING OVALS; Joshua Irving, City of New York.

Claim—The sliding disc and driving rim combined with the centre mandrel and slides.

37. HORSE-SHOE; Joseph Jorey, Rocky Hill, Connecticut.

Claim—The combination of the plate, corks, and shoe, in the manner described.

38. CULTIVATORS; Philip Kribs, Jefferson Furnace, Pennsylvania.

Claim—The arrangement of the bars, A B C, metal frame, handles, shanks, teeth, bar, I, and shafts, as described.

39. HORSE RAKES; Philip Lebzetter, Lancaster, Pennsylvania.

Claim—The double axle, brace, and sliding bands, hinged braces, slot-hook and staple, binding screw, hinged rod, and beam, combined in the manner specified.

40. VAULT DOORS AND CAST IRON SAFES; Lewis Lillie, Troy, New York.

Claim—The arrangement and combination of a series of pipes or tubes, and the filling of the same with cast steel hardened, or with refined cast iron, as described.

41. DOOR-KNOB BOLT; Lewis Lillie, Troy, New York.

Claim—The knob-bolt or spindle, constructed in the manner described. Further, the switch and the nut, arranged and fastened to and upon the knob-bolt or spindle, in the manner as set forth.

42. TRUNKS; Matthias Ludlum, Fair Haven, Vermont.

Claim—The combination with a water-tight shell or body part to a trunk or box, having ordinary or any other suitable inner and outer lids of a valvular spring borne lid of water-tight construction, and arranged to occupy an immediate position in relation to the inner and outer or ordinary lids, essentially as set forth.

43. BUCKLES; Thomas P. Marshall, Trenton, New Jersey.

Claim—A buckle, constructed of a sliding case with the platform and slot, in combination with the nose, and otherwise arranged as set forth.

44. ROTARY PUMPS; Jarrett Megaw, Wilmington, Delaware.

Claim—Combining the water-packing chambers formed around the axes or shaft, between the suction pipe and stuffing-boxes, with the descending main or discharge pipe of the pumps.

45. RAILROAD CAR COUPLINGS; Richard L. Mills and Paul Carpenter, Lancaster, Ohio.

Claim—The arrangement of the sliding frame and vibrating frame, in combination with the flat locking key, constructed as set forth.

46. MACHINES FOR PLANTING COTTON SEED; Z. N. Morrel, Cameron, Texas.

Claim—1st, The combination and arrangement of the one side-wheel, cylinder, stirrer, gear wheels, mortised beam, share, and boot, as described. 2d, The arrangement of the V-shaped fender with the harrow teeth, and with the devices included on the first claim.

47. ELASTIC FRICTION ROLLER; A. A. Moss, Philadelphia, Pennsylvania.

Claim—The elastic friction apparatus described, the same consisting of the ball or sphere, spring, and case or hole, arranged in relation to each other in the manner described, irrespectively of the plate or the conical form of the spiral spring.

48. PIN-STICKING MACHINE; J. W. Naramore, Derby, Connecticut.

Claim—1st, Operating the driver or drivers and the crimping and feeding apparatus, or any portion of the same, by means of a clutch or clutches, carried by a constantly rotating shaft, and thrown into gear therewith, to effect such operation by the action of the sliding bed or pin-carriage as the latter, after having received the pins, completes its movement to the necessary position for the sticking operation. 2d, The combination with a single reciprocating sliding bed or pin-carriage and a single conductor, of two drivers, and two sets of crimping and paper-feeding apparatus, arranged on opposite sides of the mouth of the conductor in such a manner that the said bed or carriage, in every movement in either direction, is caused to be filled with pins from the conductor, and to convey them to a proper position relatively to one or the other of the drivers, to be thereby driven into the paper supplied, and crimped by its respective feeding and crimping apparatus, whereby I effect a saving of the time heretofore lost in running the bed twice under the conductor to be once filled. 3d, Effecting the combination between the sliding bed or carriage and a clutch, carried by a constantly revolving shaft, to operate a driver, a crimper, and a feeding apparatus, or either of them, by means of a toothed lever, a spring, notched slide, or plate, with an inclined edge and a sliding tooth, the whole applied and operating to permit one, and only one, revolution of the loose portion of the clutch, and hence but a single operation of the part or parts driven by it.

49. HAND PRINTING PRESSES; A. and B. Newbury, Windham Centre, New York.

Claim—The arrangement and combination of the slotted frame, adjustable bar, platen, roller frame, and rotating ink table, as described.

50. FLOUR-BOLTS; Ellis and Addison H. Nordyke, Richmond, Indiana.

Claim—1st, The band encircling the shaft, in combination with the spring catches, for the purpose described. 2d, Making the movable slide in two parts, jointed, as set forth.

51. Clover-hullers; Anthony Overocker, McHenry, Illinois.

Claim—The combination of the concave and cylinder with the adjustable sliding door, in the manner described.

52. Manufacture of Hoes; Andrew Paterson, Birmingham, Pennsylvania.

Claim—The combination of the two jaws which clasp the blade with the head and the blade, arranged as set forth.

53. Piano Hammers; John Percival, Auburn, New York.

Claim—Constructing and arranging the cushion forming the elastic covering to the hammer-head, as described.

54. Setting Gas Metres in the Walls of Buildings; Albert Potts, Philadelphia, Pennsylvania.

Claim—The manner described of adjusting a gas metre to an auxiliary case of the character specified, so that the matter is applied to a building in a neat and a secure manner, and, at the same time, the examination of the same, to ascertain its condition or the amount of gas consumed, from the outside of the building, is rendered practicable and convenient.

55. Mode of Regulating the Exhaust in Locomotive Engines; Thomas B. Quigley, Galion, Ohio.

Claim—1st, The sliding throttle-valves, when combined with the exhaust pipes of a locomotive engine, in the manner specified. 2d, The sliding-box with apertures, in combination with the chest, as set forth.

56. Apparatus for Punching Stereotype Plates; D. B. Ray, Galena, Illinois.

Claim—The arrangement of stamping bars, D, upon A B, when provided with the characters to be printed or stereotyped, so that they will all work to a common centre, and imprint the characters upon the face of the type-metal, in the manner set forth. Also, arranging upon the end of bar, F, knives, for the purposes specified.

57. Trunnion Box-lining for Oscillating Engines; John A. Reed, Jersey City, New Jersey.

Claim—The employment, in combination with the conical trunnions of slit cap-like linings, applied to the boxes with screws and nuts, or other equivalent means of forcing them up towards the sides of the cylinder, as described.

58. Elastic Railroad Frogs; George P. Sanburn and Willis Mansfield, New Haven, Connecticut.

Claim—An elastic frog, constructed of layers of plate metal and wood, in the manner specified, and either with or without layers of vulcanized rubber. Also, constructing an elastic frog with end slots, suitable to receive the lower flanch and neck of a rail, as specified, whereby the frog may be kept in alignment.

59. Protecting Surfaces of Articles of Iron; Thaddeus Selleck, Greenwich, Connecticut.

Claim—A horse-shoe, or other article, as indicated, made by uniting Franklinite pig-metal with the surface of iron, as set forth.

60. Revolving Fire Arms; Horace Smith and D. B. Wesson, Springfield, Massachusetts.

Claim—The wedge on the top of the nose of the hammer, the spring, and stop-bolt, when combined for the purpose and operating in the manner described.

61. Ironing-pan for Ranges or Stoves; James Spear, Philadelphia, Pennsylvania.

Claim—An ironing-pan, constructed with a perforated bottom, in the manner described.

62. Picker-motion for Power Looms; Wm. Steams, Manchester, New Hampshire.

Claim—Extending the picker-staff down through and below the rocker, and through the rail. Also, the rocker, made to receive the staff, in the way and manner described. Also, in combination with the rocker, the hook, whether made separate or cast on the rocker, for the purposes set forth. Also, making the picker-staff adjustable in the rocker, in the manner described, or in some equivalent manner. Also, making the stud surrounded by the coiled spring, smaller in the middle than at the ends, to allow the spring to contract in diameter in the middle as it is drawn in working. Also, making that portion of the stud surrounded by the stationary end of the coiled spring permanent or stationary, and that portion surrounded by the moving end of the spring to revolve, to facilitate the working of the spring.

63. Scales for Weighing; Joseph W. Strange, Bangor, Maine.

Claim—1st, Arranging the beam in such a manner that the several indications or scales marked on the same, can be brought before the eye of the operator, by turning the beam. 2d, The arrangement of the socket, so that its end forms the common index-pointer for the several indications marked on the sides of the beam, as specified.

64. Gas Retorts; William Stratton, Philadelphia, Pennsylvania.

Claim—The employment of an upright partition dividing the retort into chambers, in the manner set forth.

65. Photographic Cameras; John Stock, City of New York.

Claim—1st, The arrangement of the front plate of a camera, to which the lens-tube is attached in such a manner that the centre of the tube may be moved in any desired position, for the purpose and in the manner specified. 2d, The arrangements of the plates, 5 and 8, for the purpose described. 3d, Attaching the ground glass-holder to the end of the camera, and the manner of supporting the weight of the same, as specified.

66. Cotton and Hay Presses; Elam Stockbridge, Houston, Texas.

Claim—The arrangement, in combination with the horizontal ropes or chains, vertical windlass, horizontal toggles, and horizontal follower of the auxiliary horizontal ropes or chains, in the manner set forth.

67. Churn; Josiah Stubbs, Dublin, Indiana.

Claim—Operating the butterfly wings with the single crank confined to one side of the cylinder, being made to cross the body of the cylinder obliquely to effect this movement, in the manner set forth.

68. Mercurial Barometers; Guiseppe Tagliabue, City of New York.

Claim—The external slotted sleeve gauge, applied in combination with the cistern or lower limb of the barometer, and with the adjustable scale, as described.

69. Bagasse Furnaces; Louis Tregre, of the Parish of St. John the Baptist, Louisiana.

Claim—The employment of a double feeder, arranged with springs through the blades of the lower

feeder to allow the hot air from the furnace to pass from the lower feeder to the upper feeder, for the purpose set forth. Also, arranging between the two feeders an intermediate chamber to receive and retain the bagasse as it passes from the upper to the lower feeder, and constructing the upper feeder of larger size than the lower feeder, with or without an increased number of blades, or in an equivalent manner. Further, introducing an independent current of hot, dry air into the chamber, between the two feeders.

70. HEAD-BLOCK FOR SAW-MILLS; Jacob W. Truox, Richford, Vermont.

Claim—1st, The combination and arrangement of the ratchet-wheel, setting lever, cam wheel, gauge wheel, and spur-wheel, with the spring-latch, in the manner specified. 2d, The clamps, the lever, and eccentric lever, arranged as specified.

71. SPRING-SNAP FOR BRIDLE-REINS; Marianus X. Tschus, Bloomington, Illinois.

Claim—The combination of the two in one, in the manner described.

72. CAST IRON TIRES FOR RAILROAD WHEELS; Levi B. Tyng, Lowell, Massachusetts.

Claim—1st, The wedge-shaped braces, arranged in the chamber between the rims of a hollow cast iron tire, so that the chamber is continuous throughout. 2d, In combination with the continuous chamber, I claim the groove in the inner rim, arranged as described. 3d, Arranging the ribs alternately on the inner and outer rim, for the purpose of strengthening them without tying them together, as described.

[This inventor has solved the question, to construct hollow chilled cast iron tire for railroad wheels, in such a manner that they combine lightness and durability.]

73. MODE OF PROPELLING LOCOMOTIVE ENGINES ON RAILROADS; Wm. W. Virdin, Baltimore, Maryland.

Claim—The placing of the friction wheels under the driving wheels of locomotives, or other vehicles, in the manner described.

74. MODE OF BRAKING LOCOMOTIVE ENGINES ON RAILROADS; Wm. W. Virdin, Baltimore, Maryland.

Claim—The introduction of air into the cylinders of locomotives, in manner as set forth, and for the purpose of offering a yielding resistance to the movement of the piston, and by this resistance overcome the momentum of the train.

75. RING AND TRAVELER SPINNING MACHINES; Joseph W. Wattles, Canton, Massachusetts.

Claim—The combination and arrangement of the bearing annulus with the ring or its traveler-carrier, in the manner and to operate with the traveler, as described.

76. MACHINE FOR BORING POST-HOLES IN THE EARTH; John S. Wertz, Middletown, Iowa.

Claim—1st, The arrangement and combination of the screw-shaft, cross-head, grooves, pinion, and toothed cylinders, B, as described. 2d, The arrangement and combination with the cylinders, B, of the shaft, F, and rotary scrapers, as described. 3d, The arrangement and combination with the frame of the jointed bars, sectors, and adjusting rods, as described.

[Two toothed cylinders and an auger are used in this invention, in connexion with rotating clearers and an adjustable framing, so that post-holes may be sunk in the earth by horse or other power, very expeditiously.]

77. CORN PLANTERS; J. W. West, Hillsboro', Ohio.

Claim—The arrangement of cords, with the pulleys working in arms for operating the slotted plunger and seeding bar, in the manner set forth.

78. MANUFACTURING MACHINE AND ANIMAL CARDS; William Wheeler, West Poultney, Vermont.

Claim—The construction and arrangement of the sheet metal backs and wire-teeth, in combination, as described, when united by solder applied thereto, by immersion or otherwise.

79. ALARM ATTACHMENT FOR TILLS; E. B. White, Nashua, New Hampshire.

Claim—1st, The bolt-plate provided with bolts connected by a joint to the box, and connected to a bell-striking apparatus, in connexion with the keys and a stop applied to the till, as set forth. 2d, In combination with the bolt-plate, bolt, and keys, the bars and screws in the parts of the keys, when the bolt-plate and bar are both connected with the lever on the bell-striking apparatus in any proper way. 3d, The employment or use of the sliding plate, combined and arranged with the bolt-plate and stop, to operate automatically. 4th, The employment or use of a supplemental spring fitted in a socket, or otherwise arranged to resist the movement of the bar, when said bar is used in connexion with spring bolts, as described.

80. CHURN; Loren J. Wicks, Racine, Wisconsin.

Claim—1st, The combination of the box, A, the pipe, and the box, C, when the same are used in the manner set forth. 2d, Placing the box, C, over the box, A, and providing said box, C, with a screen and depending wire gauze partitions, in the manner specified.

81. CORN PLANTERS; Henry Wiley, Frankfort, Ohio.

Claim—The arrangement of the gate, wheel, bars, hopper, rods, slides, and seed tubes, all constructed and operated as set forth.

82. MACHINE FOR BORING OR MORTISING BLIND STILES; Leonard Worcester, Lebanon, New Hampshire.

Claim—Combining the transversely reciprocating carriages, A A, with the cam cylinders, by means of the pairs of vibrating levers, in the manner set forth. Also, the notched plates for sustaining the stiles during the operation of mortising or boring the same, when the said plates are combined with reciprocating bearings, and other suitable mechanism, in such a manner that the necessary laterally reciprocating, and longitudinally feeding movements will be imparted to said plates. Also, combining the bearings of the bit-shaft with the reciprocating carriage, C, when the said shaft is so arranged with relation to the notched plates that the bits which project from the ends of said shaft will act upon the stiles as they are automatically presented to them. Also, the combination and joint operation with each other of the reciprocating carriages, A A, the notched plates, the pairs of levers, the cam cylinders, the reciprocating spring pawls, and the bit-carrying cylinder.

83. CORRUGATING SHEET METAL; W. E. Worthen and H. B. Renwick, City of New York.

Claim—The method of corrugating or moulding sheet metal by several dies acting in succession, in the manner specified, upon a sheet resting upon a bed, die, or dies, so as to cause the metal to conform to shape.

84. SELF-ACTING SPINNING MULES; John Wright, Worcester, Massachusetts.

Claim—The shaft with its screw-thread, arranged and applied as described, in combination with the carriage, the quadrant, and the shaft which drives the drawing rollers.

85. Manufacturing Corrugated Fabrics; Frederick Baare and J. G. Cawelly, Assignors to H. H. Day, City of New York.

Claim—The combination of two or more parallel series of corrugations in the same fabric, in such manner that the ridges of the adjacent series alternate. Also, combining rubber strands (one or more) with a textile material, in such manner that when the rubber contracts, the compound fabric gathers up into two or more parallel series of corrugations whose numbers alternate. Also, combining rubber strands with a textile material, in such manner that the strands are alternately secured to the fabric and left free therefrom at alternating parts of their length, so that the secured parts of one rubber strand corresponds with the free part of an adjacent one. Also, forming the fabric sleazy, at the division lines between the corrugations of adjacent series, so as to insure uniformity in the form of the adjacent extremities of the corrugations.

86. Gauge Cocks for Steam Boilers; F. W. Bacon, West Newton, Assignor to E. H. Ashcroft, Boston, Mass.

Claim—The combination of the throat-clearer with the throat and the screw-plug gauge cock, and so as to operate therewith, as specified.

87. Vulcanized Rubber Car Springs; H. W. Beins, Assignor to the New England Car Spring Co., City of New York.

Claim—The sectional gum car spring of two or more pieces, vulcanized in the manner set forth.

88. Ironing Table and Clothes Dryer; E. Culver, Assignor to self and R. N. Fife, Shelburne Falls, Mass.

Claim—The described combination of ironing table and clothes dryer, the table furnishing a support to the dryer, and a receptacle in which it may by stowed away.

89. Vulcanizing Rubber; A. K. Eaton, City of New York, Assignor (through G. S. L. Cummins, et al.,) to the Joslin India Rubber Company.

Claim—The use of the sulphide of manganese in the curing of india rubber, in the manner specified.

90. Railroad Brakes; O. F. Fuller, Lamonte, Assignor to self and W. M. Ferry, Ferrysburg, Michigan.

Claim—The brake blocks, pins, and levers, constructed and operating together as described.

91. Sugar Mills; J. R. Gates, Assignor to self, G. G. Dumont, and E. F. Sinker, Indianapolis, Indiana.

Claim—The grooved friction rollers, when used for stripping the blade from the stalk, as set forth.

92. Butter-worker; Joseph Jones, Assignor to self and James G. Bryce, Philadelphia, Pennsylvania.

Claim—The use of the yielding beater, whether solid or constructed with an open or with a perforated bottom, enclosing an absorbing material, in combination with a traveling tray, as described.

93. Manufacturing Baskets; Lansing Marble, Assignor to self and T. North, Vassar, Michigan.

Claim—The described method of forming baskets by passing a series of staves or splints through proper guides over a mould, and pressing the same in the proper shape by a suitable piston and form, as set forth.

[By the aid of this machine baskets can be formed with less labor and stronger than by hand, all the staves or splints being kept in the proper places by guides until they are fastened, and the baskets being strengthened by hoops.]

94. Harvesters; Lewis and Jacob Miller, Assignors to C. Aultman & Co., Canton, Ohio.

Claim—Extending the finger or platform bar, one or both, far enough under the yielding bars, by which they are hung to the main frame, so that the two may be united by suspension rods, which allows them a yielding motion in one direction, and makes them rigid in another direction, and prevents the motions of the main frame from being communicated to the finger bar, as described.

95. Moulding Beads on Hollow Ware; Charles Neale, Assignor to Frederick Leibrandt and W. L. McDowell, Philadelphia, Pennsylvania.

Claim—Moulding for the production of beads, flanches, or other projections and ornaments on the outer sides of cast metal pots, kettles, and other vessels, so as to form the said vessels in two part-flasks, the pattern bed flanch, or other projecting ornament, being so constructed, arranged, and operated as to admit of its being drawn in and pushed out of the vessel pattern.

96. Hawse Pipe for Ships; A. S. Philips, Boston, Assignor to self and Isaac Adams, South Boston, Mass.

Claim—A tubular cable guide curved, as described.

97. Corn Planters; Peter Plater, Assignor to self and J. S. Fleming, Moore's Hill, Indiana.

Claim—The arrangement of the shield, hammer, sliding feed bar, lever, crank shaft, and spring, the whole being constructed as set forth.

98. Threshing Machines; John I. Rollow, Assignor to Charles C. Wellford, Fredericksburgh, Virginia.

Claim—The combination of the inclined carrier with the shoot and curved screen, the whole being constructed as set forth.

99. Machine for Pointing Nails and Spikes; Wm. Spink, Assignor to Oliver A. Washburn, Jr., Providence, Rhode Island.

Claim—The combination of the bunter, the pointer, and the spring with each other, and with the back piece and other parts of the reed machine, or with the corresponding parts of any other nail machines, constructed in the manner described.

100. Machine for Washing and Amalgamating Gold; George C. Wheeler, Graysville, Georgia, Assignor to self and George Calvert, Upperville, Virginia.

Claim—1st, The relative arrangement for united operation of the hopper, horizontally revolving vertical tubes, horizontally revolving rakes, and stationary washing vessels, B C. 2d, Making the receiver or washing vessel in two parts, B C, and combining with the part, C, an adjusting device, D, as described.

101. Device for Operating the Cut-off Valve of Steam Engines; W. W. W. Wood and Henry Howson, Assignors to John Rice, Philadelphia, Pennsylvania.

Claim—We limit our claim to causing the positive power of the engine to operate the throttle valve, by the employment of two vibrating, reciprocating, or rotating strikers, actuated by any positive movement of the engine, in combination with two inclined planes intervening between the said strikers, and the valve or appliances connected therewith, any governor being so connected to the strikers or to the inclined planes, that the movement of the governor caused by any increase or diminution in the speed of the engine, shall change the position of the inclined planes in respect to the striking, or that of the strikers in respect to the inclined planes, and that the latter may thereby be the intermediate means of regulating the extent of the opening of the valve to suit the speed of the engine while the actual movement of the valve is effected through one or the other of the strikers by the power of the engine itself, as set forth.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On Embroidery by Machinery.** By George Wallis.

The object of this paper is simply to give a popular description of the leading features of the embroidering machine, and to illustrate its practical use and capabilities by specimens of textile decoration produced by it. A full and complete description of this machine would involve either the presence of a machine in full work, or such a series of elaborate drawings, diagrams, or models, as would render the task of description neither pleasant nor profitable. No attempt, therefore, will be made to do more than simplify the principle upon which the machine is constructed, and give such illustrations of its action and capabilities as may serve to show its superiority over, or indicate its inferiority to, the human hand in the production of embroidered effects. The diagrams used will be such simplifications of construction as will be best calculated to render that construction intelligible, and are in no way intended as illustrations of the complete mechanical structure of the parts described, or of their full action.

As an interesting branch of art-industry, embroidery by machinery is more wondered at than understood, and it is no uncommon thing to find the mechanical agent used in its production confounded with the various sewing machines which have recently come so largely into use for a variety of purposes. Machine embroidery may, as it did some ten or twelve years ago, stimulate the productions of hand embroidery, and to a certain extent, supplement them, but it is doubtful, to say the least, if it can ever supplant them. Excelling hand embroidery in accuracy of repetition, and in the production of the same design on both sides of the fabric decorated, it is limited in its range, alike as regards subject and the article to which it can be applied.

In variety of effect it can never compete with hand embroidery, and, although, as in the dress embroidered for Her Majesty, by the late Mr. Louis Schwabe of Manchester, the effects of the original drawing are given in all their variety, this has only been done at a great sacrifice of all the economic powers of the machine. When Mr. Schwabe first showed me this specimen in 1844, he said, "I was written to and asked if my machines would execute any design? I replied that any design which Her Majesty wished executed should be produced by them. When the drawing came I saw the mistake I had made, but resolved, cost what it might, that the work should be done and there it is." As an illustration of what can be done by the embroidering machine, the example is interesting, but as an illustration of its economic use, or its superiority over hand embroidery, it is worthless.

Having said thus much as to the true purposes of machinery as applied to embroidery, it may be useful to make a few introductory remarks on the subject of embroidery as an art of so ancient a character, that its origin is entirely lost.

* From the Jour. of the Society of Arts, No. 333.

The early history of embroidery is associated with the progress of civilization and refinement as an elegant employment for females; and one which, from a remote antiquity, exercised a large and abiding influence on ornamental art. It is the most primitive mode of textile decoration, and ranges at once from the simplest figure to the most intricate elaborations of a variety of materials requiring the skill of the needle-woman, with the invention of the ornamentalist. It is practised in one form or another wherever man has made any advance beyond the rude art of ornamenting his body by tatooing. The wonderful embroidery of the Peruvians, which so astonished their Spanish invaders, displayed surprising effects of color produced by the plumage of tropical birds, combined with threads of gold and silver. In all periods of the world's history, among the richest specimens of ornament dedicated to the service of ceremonial religion, we always find embroidery. In the Mosaic Tabernacle the embroidery of purple, blue, and scarlet was conspicuous, and the elaborate embroidery of sacerdotal vestments, especially those of the high priest, show how largely this sacrificial ornamental work was used in the early ceremonials of the Jews.

In the last chapter of the Proverbs of Solomon is an interesting picture of the virtuous wife, whose "Lamp goeth not out by night," and who "worketh beautiful vestments for herself,"—

> Her clothing is fine linen and purple.
> Her husband is known in the gates,
> When he sitteth among the elders of the land.
> She maketh him fine linen and selleth it;
> And delivereth girdles unto the merchant.
>
> Verses 22, 23, 24.

In the prophecy, by Ezekiel, embroidery is mentioned as the clothing of Jerusalem, represented under the figure of a woman.

> "I clothed thee also with embroidered work."
>
> Chap. 16; verse 10.
>
> "Thou wast decked with gold and silver;
> And thy raiment was of fine linen and silk and embroidered work."
>
> Verse 13.

The Egyptians used embroidery to a very great extent. The sails of their boats were of embroidered linen, and the wrappings of their dead were frequently thus decorated.

The Greeks attributed the invention to Minerva. Homer describes two of his heroines as engaged in embroidery—Helen, as depicting the combats of the Trojan war, and Andromache,—

> "In the chamber at the palace top,
> A splendid texture wrought on either side,
> All dazzling bright, with flowers of various hues."

The women of Sidon are said to have been noted for their skill in embroidery even before the Trojan war. Pliny attributes its invention to the Phrygians, hence the Roman name for embroidered garments,—*Vestes Phrygioniæ.*

It should be understood, however, that the word signifying "embroidery" is used by ancient writers as a generic term for all kinds of decorative work done by the needle. In later periods, the sense

was limited to peculiar effects produced by certain fixed methods, and in more modern times a still greater limit is understood.

The practice of embroidery in Europe was very largely extended during the mediæval periods, and was carried to great perfection for the personal adornment of royalty, the nobility, and especially in the service of the church. The vestments of the priesthood, hangings, veils, canopies, curtains, and other textile articles of use and decoration, were largely embroidered; indeed, the character of the work of this period was chiefly ecclesiastical, and the inmates of convents employed their time in this direction with remarkable results. Some of the most valuable illustrations of the manners and costumes of past ages have come down to us through the agency of the needle; and in proof of this it will be sufficient here to allude to those interesting records in embroidered work and tapestry, as coverings for the walls of rooms, and hangings for doors, windows, and corridors, in the execution of which the ladies of noble families beguiled their leisure hours. Family traditions, historical incidents, portraits, the sports of the field, and groups of natural objects, were all employed in the execution of textile ornaments for the decoration of apartments. In England this art was carried to a high degree of perfection, and in the execution of vestments, English work was so highly prized as to have been constantly sent out to Rome by command of the Pope. There can be little doubt that the skill in embroidered work displayed by our ancestors was the forerunner of several of our most common kinds of ornamentation. Paper hangings, for instance, were originally professed imitations of tapestry, the patterns having been first printed on canvass.

Ancient embroidery is divisable into three heads:—"*Low*" embroidery, in which the threads are laid flat on the ground of the work: "*Raised*" embroidery, in which the figures are brought into relief, and rounded by means of wool, cotton, parchment, or paper placed beneath the needle-work: "*Gimped*" embroidery, in which the figures are formed by cords of gold, silver, or silk and portions of velvet or satin, gold and silk.

Hand embroidery is still extensively practised in the East. The true Indian and Persian scarfs are embroidery work of floss or untwisted silk, and exceedingly rich effects are thus produced, as will be remembered by those who examined the Indian productions of this class in the Great Exhibition of 1851.

In Turkey and Greece embroidery with gold and silver thread, or richly-colored cottons, silks and velvets, is much used for robes and decorations. The embroideries exhibited by Turkey, in the Great Exhibition of 1851, were of a marvellous character in execution, and deserved much more attention than it is to be feared they received. As commissioner of one of the groups of Juries, I had to direct attention to them, and in the midst of so much that was excellent, the difficulty lay in selecting those most worthy of reward. The articles embroidered were all made up for use as clothing, and the jury for that class had therefore to undertake the work of adjudication. Such

was the difficulty of selection, that the task was nearly abandoned in despair, and nothing but an urgent demand on my part that so remarkable a display should have full justice done to it, induced the jury to proceed. From the system adopted by the Turkish authorities in collecting and registering the works, some of the best had to be passed over, and the jury finally reported:—"It is impossible to recognise, either by medal or honorable mention, many of those to whom such distinctions are justly due, as no names are given whereby the jury can take cognizance of the articles. Those cases which the jury have been enabled to recognise are selected as much for the facility for giving such recognition, as for the high merit displayed in the production, inasmuch as there are others deserving of the same consideration, could the jury have discriminated amid the vast collection of articles." The awards are curious, and all to women, except a prize medal to the Tailors' Association of Janina for Albanian costumes. Whether the daughter of the Turkish gentleman with an unpronounceable name ever received the awarded medal, or the girls Bukudgy and Istche, or the wives of Carabet and Tetzy got information of the "honorable mention" made of their embroideries, is a matter of speculation to this hour with those who desired to do them justice.

Probably the finest modern examples of pure embroidery in silk, unmixed with gold and silver thread, pearls or precious stones, are executed by the Chinese. Not only in execution, but in design and the fitness of the forms of the ornament to the material and purpose, the embroideries of the Chinese generally exhibit a great superiority to the usual examples of European skill. The extreme care taken with the work, especially in the more costly specimens, renders them very instructive examples of textile decoration. From 700 to 750 stitches may be counted in the space of a square inch. Some years ago I took the trouble to dissect some of the best examples I could meet with, and the more closely they were examined the more marvellous the work appeared. Some diagrams now before you show the peculiarities of treatment, and illustrate in some degree the arrangement of the stitches.

Of course, the leading Continental nations are producers of embroidery, especially France, but the styles adopted are usually either a re-production of the ancient methods, or imitations of Eastern productions.

This brief sketch of the progress of embroidery by hand, must suffice to introduce the special subject before us,

EMBROIDERY BY MACHINERY.

This has been effected to a considerable extent by the Jacquard and Draw looms, or rather effects in imitation of embroidery have been produced. With this, however, we have nothing to do, as machine embroidery, by the legitimate means of the needle, is the point which it is desired to explain and illustrate.

The first idea of the embroidering machine originated with M. Josué Heilmann of Mulhouse. His object was to combine accuracy of repetition over a large surface with economy of production. Selling it to

Messrs. Koechlin, also of Mulhouse, he developed the principle of its construction in their establishment, where it was first practically applied to manufactures. The invention appears to have been first brought before the public in the National Exposition of the Products of Industry, at Paris in 1834; but the machine was patented for England about 1829, and with all rights, &c., purchased from Messrs. Koechlin by Mr. Henry Houldsworth, of Manchester, by whom it was subsequently very greatly improved from time to time. The first successful use of the machines as improved was in the silk manufactory of the late Mr. Louis Schwabe, in the then Portland-street Mill, Manchester; Mr. Houldsworth, having made an arrangement with Mr. Schwabe, as a manufacturer in whose trade their powers would find most development. Here they were employed in embroideries for upholsterers, but chiefly in the "sprigging" of waistcoatings, to which they were peculiarly adapted, as will be shown in the course of the illustrations of the construction and action of the machine.

The leading principle of the machine in the production of a pattern is that of the pantagraph, by which a given form is copied to a fixed scale, in this particular instance to one-sixth the size of the guiding pattern.

The machine may be divided into *three* parts:—

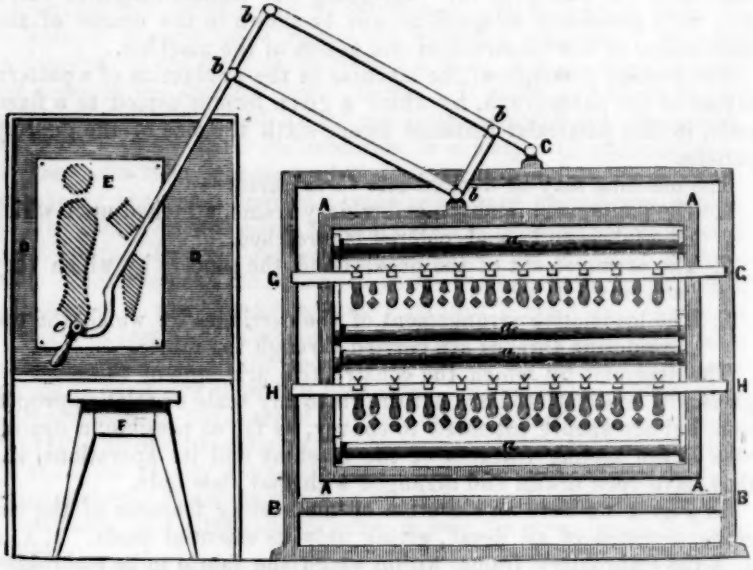
1. The pantagraph and the embroidery frame, attached upon which the fabric to be embroidered is stretched.
2. The arrangement of the needles and the pincers by which they act on the fabric.
3. The locomotive arrangement of the carriages by which the embroidering threads are carried through the fabric.

The diagrams by which the constructive principle of these several parts will be illustrated are not drawn to any scale or relative proportion, but are simply intended to convey, as far as possible, a distinct idea of the leading features of the machine and its operations, and they have been drawn and arranged with that view only.

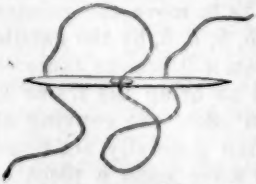
In Fig. 1 we have an elevation of the leading features of the machine, divested of all detail, giving only its essential parts. A, A, A, A, is the embroidery frame, within which the fabric to be embroidered is stretched in two divisions, an upper and lower one, upon rollers *a*, *a*, *a*, *a*. This swings from the outer frame B, B, B, B, at the pivot of the pantagraph C. Every person who understands the action of an ordinary pantagraph, will at once understand that if a figure of suitable design and size is fixed on the vertical plane D, D, as shown in the pattern E, all that will be required in order to copy this pattern to a fixed scale on the plane A, A, A, A, will be to move the pointer c of the lengthened side of the parallelogram *b*, *b*, *b*, *b*, by the handle attached to it. The angles of this parallelogram will become acute or obtuse, just according to the motion required to bring the frame A, A, A, A, into its proper relative position. To effect the copying of the pattern E by a series of stitches, a drawing generally six times the size of the pattern to be embroidered, is made upon a piece of stout paper, or a plate of tin. Each stitch is arranged to this scale, and a hole punched in the paper or plate at each end of every stitch.

Into this hole the pointer of the pantagraph is inserted before each stitch is taken. This point is moved backward and forward across the pattern, upon the system of stitches laid down, by the embroiderer seated on the stool F; and with each motion the needles are drawn backward and forward through the fabric by a corresponding action of the carriages, on the frames of which the pincers which hold the needles are fixed, as indicated; G to G in the upper tier thus embroidering the upper piece of cloth, and H to H in the lower tier, by which the fabric fixed upon the lower pair of rollers is embroidered. The pattern E is thus repeated one-sixth the size, each needle in operation executing a repeat, and the pattern when finished extends the whole width of the fabric at one operation.

Fig. 1.



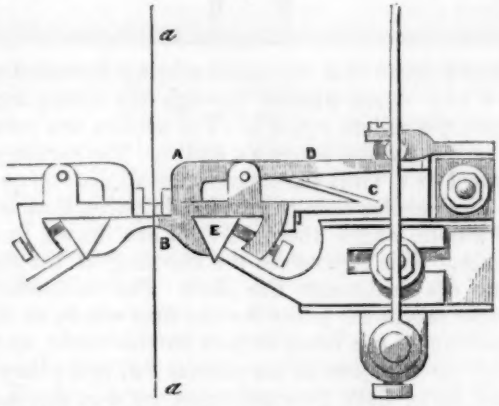
The arrangement of the needles, and the mode by which they are alternately held and released must now be noticed. The needle-holder or pincers act in a manner analogous to the human hands, working from each side of a framework of cloth, placed in a vertical position, the needle being a double-pointed one, with an eye for threading the silk in the middle, thus:—



The pincers are arranged, as already stated, in a double row on two tiers across the frame work of the carriages on each side of the embroidery frame, and project over, so as to come in contact with the fabric when stretched upon it. (See Fig. 3, *a*, *b*, *c*, *d*.) They are placed at one inch and a half from each other, and the larger machines have as many as 75 in each row. The construction of these pincers may be illustrated in profile by Fig. 2.

A is the upper jaw of the pincers, which is kept down upon the needle by the action of the spring, C. By this spring the upper jaw is brought back into its place after the end has been pressed down at D, to release the needle after it has pierced the fabric, (as shown in section at *a a*,) and been received by the opposite pincer. B is the lower jaw, which is, of course, fixed to the frame. The prismatic rule E runs the whole length of each series of pincers, and sustains them, in a perfectly true and corresponding position. The arrangement for the release of the needle after it has been driven through the fabric cannot be easily explained; it must, therefore, suffice to say, that the upper jaw of the pincer is pressed down at the proper time by the action of a rod on the lever end D, and the needle thus released, after having passed through the fabric, is held fast by the opposite pincer, the thread being thus carried to its full tension, as shown in Fig. 3 at F, and then brought back again to the fabric to be taken up in the same manner by the pincer from which it had been released, again to return at each motion of the pantagraph handle indicating another stitch.

Fig. 2.



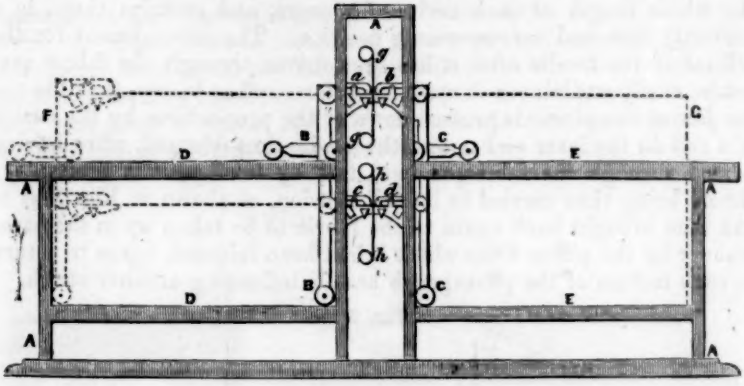
Originally this release of the needles depended upon the worker of the pantagraph, who had to use his or her feet upon treadles provided for the purpose, and attached to the releasing rod. One of the improvements effected by Mr. Henry Houldsworth was a mechanical arrangement by which these treadles were dispensed with and the pantagraph worker or embroiderer proper, released from the duty of attending to two movements. By this arrangement the releasing rod is acted upon by a clock motion, which is brought into play at the instant the carriage is driven against the frame work when the needle passes through the fabric.

The locomotive arrangement of that portion of the machine which carries the pincers and needles, may be understood in its elementary form by a reference to Fig. 3.

A, A, A, A, A, represents the structural frame-work of the machine, and is of iron; B B and C C the carriages acting on each side of the fabric; *a b* and *c d* indicate the position of the pincers carrying the

needles. These carriages run on a species of railway along the horizontal lines D D and E E, and are required to be most accurately fitted. The section of the fabric stretched in a vertical position on the rollers *g g* and *h h*, and passing between the upper and lower tier of pincers, gives the centre line of the diagram.

Fig. 3.



We will now assume that the needles being threaded and fixed in the pincers *b* and *d*, are pushed through the fabric represented as stretched upon the rollers *g g*, *h h*. The needles are released from *b* and *d*, and seized by the pincers *a* and *c*. The carriage B B is then drawn backward to F, until the threads are all drawn equally through the fabric. The needles being threaded in pairs, that is to say, with a thread of double length, these threads are drawn up to their full tension at once. This supersedes the knotting of the thread to prevent its being drawn through the cloth. The embroiderer sitting at the pantagraph moves the point for the first stitch, as shown in Fig. 1 at E, the carriage B B is brought back to the fabric, and the needles forced through into the jaws of the pincers *b d*, again they are released from *a c*, and being duly fastened upon by *b d*, the carriage C C is drawn along the frame until the thread is again at its full tension, when the carriage reaches G. Stitch the first is then complete.

The pantagraph pointer is again moved for another stitch on the enlarged pattern E, Fig. 1, and again the process of bringing up the needles to the fabric—their passing through—their release on one side and their seizure on the other is repeated, and so the work goes on until fresh needles and thread are required, when the same course is repeated in the putting in, and starting the work at the same point at which the last stitch of the former thread left the work incomplete.

Each machine is usually worked by three young women and three or four girls, the latter being employed to thread the needles and prepare them for the machine, that a supply may be always on hand. One young woman—who is generally the most experienced, and acts as the "captain" of the machine—attends to the pantagraph, criticises the work, and directs the motions of the workers of the carriages, who push backward and forward the rows of needles. With an intelli-

gent "captain," quick and skilful workers, and rapid threaders, an elaborate pattern, and a machine in good working order, I know nothing in manufactures more interesting than the embroidering machine. The pattern grows so rapidly under its action; every stitch tells toward the final effect; and the result is at once so satisfactory, that the operation appears to be the realization of the thought of the workers direct from their minds, and with no more mechanism than is necessary to realize that thought.

(To be Continued.)

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*Heat-conducting Power of Metals.**

An elaborate paper, which cannot fail to be of utility to our industrial community, has been communicated to the Royal Society by Professor F. Crace-Calvert and Mr. Richard Johnson on the "Relative Power of Metals and Alloys to Conduct Heat." Before describing the process followed and examining the results obtained, it is necessary to state that they made a great number of experiments, with the hope of solving the important chemical question—are alloys simple mixtures of metals, or are they definite compounds? With this view they operated on a large number of alloys and amalgams, convinced that if the chemical nature of alloys and amalgams is still enveloped in darkness, it is because they have been prepared with impure or commercial metals, and not made in equivalent quantities. The consequence has been that as metals have only a slight affinity to each other, and as the definite compounds which they have a tendency to form were mixed with an excess of one of the metals employed, the alloys produced have presented properties which could lead to no information as to their nature. These difficulties have been increased by the fact that in many alloys, such as those of copper and tin, or copper and zinc, the metals have a tendency, when allowed to cool slowly, to form several crystallizable compounds differing in their composition in the various parts of the alloys, the less fusible being on the exterior and those more so in the interior of the mass. The impurities existing in commercial metals are often so large as considerably to modify the property of their alloys; for they found in their researches that if 1 per cent. of a metal be added to 99 of another, it alters its conducting power most materially. To avoid these causes of error they composed their alloys of pure metals, and employed definite proportions.

The apparatus used appears in every way calculated to give reliable results, and Messrs. Calvert and Johnson's remarks are certainly entitled to be considered the most complete which have yet appeared on the subject. They provided a deal box (105 millims. in width, 165 millims. in length, and 220 millims. in height), with a cover, and painted white internally and externally. Inside this box are two vulcanized india rubber square vessels, the sides of which are 15 millims. thick. The larger vessel measures internally 52 millims. on the side, and 125 millims. deep, and is capable of containing 336 cub. cent. of

* From the Lond. Mining Journal, No. 1230.

water. The smaller vessel is 27 millims. on the side and 125 millims. deep, and has a capacity of 90 cub. cent. These vessels are painted white, and surrounded with wadding; and, still further, to prevent any radiation of heat, a deal board is placed between the two vessels. So little heat is radiated from the larger vessel when it contains 200 cub. cent. of water at 90 deg. to the smaller vessel containing 50 cub. cent. at 16 deg., that in a quarter of an hour, the time required for their experiments, the water in the vessel did not rise one-tenth of a degree centigrade. Therefore all sensible radiation and conduction was avoided, and the rise of temperature in this vessel during the experiment must have been entirely due to the heat conducted by the square bar of metal used. This bar is 6 centims. long and 1 centim. square, and is so arranged in the experiment that 1 cub. cent. is in the larger vessel; 1 cub. cent. in the smaller vessel; 3 cub. cent. are covered by the sides of the boxes through which it passes; and the last 1 cub. cent. is covered with a piece of vulcanized india rubber tubing, and the whole made secure from any leakage by lining the sides of the holes through which the bar passes with a varnish made of caoutchouc dissolved in benzoine. All being ready for the experiment, 50 cub. cent. of water, at the temperature of the room, are poured into the smaller vessel, the boxes covered, and each provided with a very sensitive thermometer, and 200 cub. cent. of boiling water are poured into the larger vessel by means of a funnel; the temperature of the liquid falls to 86 or 88 deg., but is again raised to 90 deg. by a small jet of steam generated in a flask, the water in which is kept boiling during the whole experiment. The conducting power of the metal being tested is noted with the greatest care.

The relative conductibility (taking silver at 1000) of the several metals is—gold pure, 981; gold with 1 per cent. of silver, 840; copper rolled, 845; copper cast, 811; mercury, 677; aluminium, 665; zinc rolled, 641; zinc, cast vertically, 628; zinc, cast horizontally, 608; cadmium, 577; malleable iron, 436; tin, 422; steel, 397; platinum, 380; sodium, 365; cast iron, 359; lead, 287; antimony, cast horizontally, 215; antimony, cast vertically, 192; bismuth, 61. For mercury and sodium they employed a very thin sheet iron box, the internal dimensions of which were exactly those of the square metallic bars they usually employed, and of the conducting power calculated, but the figures are very near the truth. It will be seen on reference to the figures for rolled and cast copper that the molecular condition of metals has an influence on the conductibility, and the influence of crystallization is apparent from the difference of the results obtained from zinc cast vertically and cast horizontally.

Glaze for Earthenware.

M. Hardsmuth proposes the following in place of the ordinary lead glaze:—Take boracic acid, 15 lbs.; calcareous spar, 5 lbs.; clay, 5 lbs.; wood-charcoal, 1 lb. Powder the mixture, and calcine to complete fusion; allow it to cool; powder again and apply it as the common lead glaze is applied.—*Cosmos.*

*New Chemical Balance.** By Mr. J. B. Cooke, of Liverpool.

The balance is an instrument of prime necessity to the exactitude of the results sought for in the operations of the chemist. But it is also a very expensive piece of apparatus, and its delicacy requires it to be guarded with the utmost care from the effects of damp, and the other vapors and fumes incidental to a laboratory. The following is the description of an instrument which has been in constant use for more than a year, and which is at once sensitive, effective, inexpensive, and not liable to injury. It weighs quantities amounting to 2400 grains with an accuracy unmistakeably distinct to the $\frac{1}{10}$th of a grain.

Though freely exposed to an atmosphere which in twelve hours covers a polished iron surface with rust, and which is often loaded with fumes of hydrosulphuric and other acids, it is now as sensitive as on the day of its construction.

The materials of which this balance is composed are to be found in every laboratory. Their first cost need not amount to 5s., and they can be put together by the chemist himself in the course of two or three hours, so as to be in perfect working order.

To those operators whose object is the attainment of accuracy with the smallest expenditure of means, it is hoped that a desideratum is here supplied, although some of the points usually considered essential to a good balance appear to be disregarded.

The beam is formed of glass tube. A piece of barometer tubing of 12 or 18 inches in length, or even the full length of a barometer tube, if economy of space is not important, may be employed. Another glass tube of about 3 inches in length, and of diameter and thickness proportioned to the weight it is destined to bear, is attached to the beam tube at right angles, at about the middle point of each. Exactitude in any of these particulars is not essential. The attachment may be made by any convenient means, say by fine iron wire covered afterwards with sealing-wax melted on to it.

If a portable balance be desired, a suitable stand must, of course, be provided; but if the instrument be intended to occupy a permanent position, it may be made to work upon an open shelf, and the present description applies to the latter circumstances.

Two other glass tubes, of about two inches in length, are cemented longitudinally upon the surface of the shelf, parallel to and at a distance of $1\frac{1}{2}$ inches from each other.

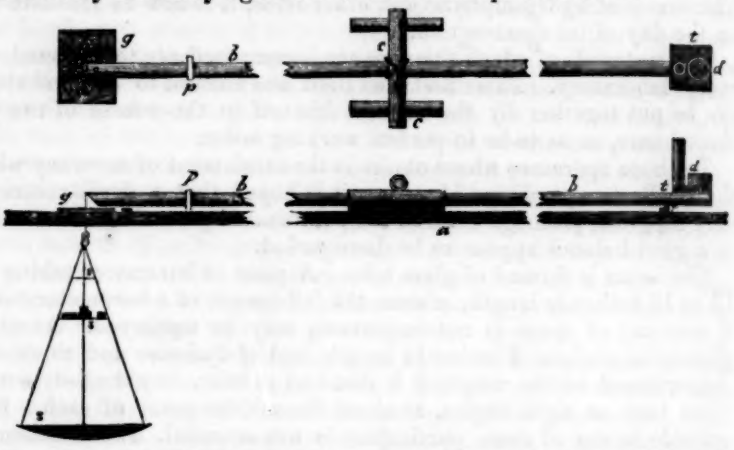
They must be equal to each other in diameter, which must be greater than that of the beam tube, or they must be raised equally to some small distance above the surface of the shelf, so that when the transverse tube attached to the beam is placed across and upon them, the beam itself, lying between and parallel to them, shall be raised at its centre at least $\frac{1}{4}$-inch above the shelf. The three small tubes should be selected of good shape and polish.

By this arrangement the beam, when in equilibrium, is supported

*From the Mechanics' Magazine, April, 1859.

upon two points, which, owing to the roundness, smoothness, hardness, and chemical inertness of the material, approximate closely to mathematical points not liable to injury from oxidation or friction. Knife-edges working upon planes of whatever substance, are not theoretically so perfect in action as the above *points* of support, and it would be difficult with the finest art to make them practically more sensitive.

A piece of sheet-copper is fastened on to the shelf under the beam near each of its ends. An edge of each piece of copper, running transversely to the shelf, is turned up at right angles to serve as a support at such a height that, when one end of the beam, loaded with its full weight, is resting upon one of them, the other end may be separated from its resting place by about $\frac{1}{20}$th of an inch. If the under-surface of the beam be blackened about these places of support, the separation shows very distinctly against a white surface placed behind.



The weights, and substance to be weighed, are both applied at the same end of the beam; the other end being compensated by a constant counterpoise; a peculiar form of scale pan is therefore required. It is convenient to have three tiers of pans hung in a pyramidal form at a suitable distance from each other by the same three silk strings. The largest and lowest is destined for the substance to be weighed. The middle one in size and position for the larger weights, and the smallest and uppermost pan contains the weights below 10 grs. This compound scale pan is suspended by a bent wire to a loop formed at one end of a short silk thread, which, passing vertically through a small hole in the shelf, and bisecting the end-section of the beam tube, is cemented with sealing wax on the upper surface of the tube. The thread should lie in a slight notch filed on the upper circumference of the end of the beam, and should hang freely from it, the lower circumference being ground away to prevent contact. The thread must also of course be carefully protected against contact with the sides of the opening in the shelf. The better way is to make an opening of about one inch square through the wood, and afterwards to cover over the greater por-

tion by four slips of window-glass crossing each other, and leaving only a small hole in the centre for the thread. If this opening be large, the balance will be affected by currents of air which always occur upwards or downwards in such circumstances. The surface of the shelf between the centre of the beam and that end of it to which the pans are hung, is divided into 10 equal parts by ink lines; and a platinum rider weighing $\frac{1}{10}$th grain is applied to this arm of the beam, and by traversing over each division marked on the shelf causes the variation of $\frac{1}{100}$th of a grain, and dispenses with the use of weights smaller than $\frac{1}{10}$th grain.

The sensitiveness of a balance is proportional to the approximation to each other of the centres of suspension and of gravity. In the present instance, the centre of suspension is the central point of the mid-section of the small tube attached to the beam, and since the weights of the beam itself and of the scale pans and their contents, are referred to a point much below this, some provision is required by which the centre of gravity of the whole mass may be considerably raised, and its position nicely regulated. The provision required is found in the mode by which the compensation is applied at the end of the beam destitute of scale pan.

On the upper side of the compensation-end of the beam is cemented horizontally with shell-lac, a table of window-glass of about 1 inch square surface. On this table again are cemented, by the same means, in vertical juxtaposition, two glass tubes; one about 3 inches high and $\frac{1}{4}$-inch in diameter, the other 1 inch high and $\frac{3}{4}$-inch in diameter. A quantity of dry pure mercury is then poured into the tall tube until the beam, whose scale pan is loaded with about $\frac{2}{3}$rds the weight which it is destined to carry, is nearly in a state of equilibrium. If the tall tube be sufficiently high and narrow, it will then be found that the centre of gravity has risen above the centre of suspension, as will be evidenced by the setting of the beam at either end indifferently according as it is placed.

Mercury is now poured gradually into the shorter tube, and after each addition weights are added in the scale pans to produce equilibrium. By every such addition the centre of gravity will be proportionally lowered, and may be brought with the utmost nicety within any assignable distance from the centre of suspension.

The adjustment will suffice for the purpose of the balance, when the transference of the rider over one division of the shelf towards the centre of the beam shall raise this end of the beam from its supports, and the replacing of the rider in its former position, shall restore the preponderance of the weights, and when on frequent trial this is the invariable result.

The balance is thus left with an extremely small amount of overpoise. The substance to be weighed is placed in the lowest pan. Weights are removed from the upper pans, and ultimately the rider is moved over the arm towards the centre, to the point at which the beam is first caused permanently to resume its normal position. The sum of the weights removed, together with the number of degrees passed over

by the rider reckoned as $\frac{1}{100}$ths of a grain, will be the weight required.

The advantages claimed for this balance are, easy construction, cheapness, non-liability to injury from exposure or rough handling, the whole operation of weighing being confined to one end of the beam without loss of sensitiveness, and the separation of the large from the smaller weights.

The engravings illustrate, in plan view and side elevation respectively, the new balance. *a* is the shelf; *b*, the beam; *c c c*, three small tubes; *d d*, tubes for mercury; *s s s*, three scale pans; *g*, glass plates to cover; *h*, hole in shelf; *p*, platinum rider; *t*, small table; and *r r*, copper rests.

The method of mounting is not inferior in sensitiveness to that of the best constructed instruments, and the limits of its sensitiveness are far from being reached in the specimen above described. As an illustration of this assertion, the following rough experiment is adduced. The writer constructed a balance, of which the beam was a tube of thick glass 22 inches long, and 1 inch in external diameter, and weighing alone $1\frac{3}{4}$ lb. The scale pan was loaded with a weight of 1 lb. The compensation was then readily effected with mercury to such accuracy that the translation of a platinum rider weighing $\frac{1}{10}$th gr. along the beam, over a space equal to $\frac{1}{10}$th of the length of the arm, sufficed to change the preponderance in favor of the one arm or the other, according to the direction of its transference. This roughly-formed balance, therefore, which, exclusive of the scale pan, did not occupy two hours in construction and preparation for use, was sensitive to a weight of $\frac{1}{100}$th of a grain, or to $\frac{1}{7000}$th part of the weight to be estimated, and about $\frac{1}{2000000}$th part of the whole weight supported on the fulcrum.

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*Supply of Coal.**

M. de Carnal, one of the greatest owners of coal mines in Prussia, in a statistical work on coal digging, states that the quantity of coal dug in 1857 amounted to 125,000,000 of tons, a mass which piled up 6 ft. high, would cover a geographical square mile. The lands from which the coal is procured, may be estimated at 8000 square miles, and the mean depth of the beds of coal at about 31 feet. The mass of coal, then, known to exist would form a cube of 10 miles. If we compare this enormous bulk of coal with the quantity annually consumed, we may confidently affirm that there is enough to last for 36,000 years. The calculation of 31 ft. for the mean depth of the beds is, perhaps, too low, for the coal fields of Liege extend to 55 ft., those of Staffordshire to 151 ft., and those of Ruhr to 134 ft. The coal dug in 1857 amounted in value to £37,500,000 sterling, a sum far beyond that realized by the digging of the precious metals. In England some calculations have been made with regard to the yield of coal in our own country, according to which the coal fields of Great

*From the London Mining Journal, No. 1236.

Britain yield 63,000,000 tons of coal per year. A better idea of the immense commerce of England could not be formed than by stating the fact that at Manchester and its environs a motive steam power equal to 1,200,000 horses is constantly maintained, to support which there are consumed 30,000 tons of coal per day, or 9,500,000 a year. In the manufacture of salt alone about 3000 tons are consumed per day, or 950,000 a year. The Transatlantic steamers from Liverpool and other ports consume 700,000 tons per year, and the manufacture of gas absorbs 10,000,000 tons per year. The export of coal from England reached, in 1858, 6,078,000 tons. It is estimated that England alone could furnish enough coal for the consumption of the whole of Europe for 4000 years.

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*How Great Guns are Made.**

In our last week's number something was said about the quality and character of iron requisite for producing sound heavy guns, and the experiments made at Woolwich during the last two years were referred to. This week we propose to give further information on the important subject, and more especially in reference to the furnaces and other appliances connected with the Woolwich factories. A 68 lb. gun, when finished, is 17 feet long, 28 inches in diameter at the breech, and weighs 95 cwt. As guns of this description are cast vertically, and require a "dead head" of considerable magnitude in order to insure sufficient density, it may be imagined that the furnaces are matters of important consideration. In practice it was found advisable to use two furnaces in the melting of a sufficient quantity of iron for the production of one such gun as we have described. The Woolwich furnaces would each hold sufficient molten metal for the casting of one gun, but as it was not possible to charge with ten tons of pig iron at once, it was found better in every way to charge two furnaces with five tons, and melt simultaneously. The quality of the iron produced in this way was found to be superior to that resulting from one furnace, when a portion of the charge must have been melted first and the remainder afterwards. Repeated tests proved this fact to demonstration, and it is a practical point of much consequence. The Woolwich furnaces are partly constructed of Stourbridge fire-brick, but the beds are of a different material. The throwing in of old "carronades," "dead heads," and "pigs," was found to chip off, or to crack and destroy the fire-bricks, and a substitute for these, in the construction of the furnace beds, had to be found. A cheaper substance, and one which admits of easy repair, is now used. It is composed of equal parts of glass-grinders' sand and blackfoot sand. The former is the refuse from the Thames patent glass works, and contains a considerable admixture of fine particles of glass, and the latter is obtained from the sand pits at Charlton. These are amalgamated, rammed hard upon the foundation of the furnace, and, after the application of heat, form a vitrified surface,

* From the Lond. Mechanics' Magazine, April, 1859.

impervious to liquid iron. The sand furnace bed is, in point of efficiency and economy, immeasurably superior to that of fire-brick, and we strongly recommend it. With respect to the dimensions of the furnaces, it may be stated that they are about 22 ft. long, from centre of fire-grate to centre of chimney; 5 ft. 2 in. wide; and 2 ft. 6 in. in height from bed to crown. The fire-grate is 5 ft. 2 in. square, and open for the admission of air at the end of the furnace, and the chimney is 60 ft. in height and 2 ft. 6 in. square. The furnaces are always heated before receiving their charges, and when the latter are sufficiently fluid and hot, the molten streams from two furnaces, as we have stated, are made to flow through separate channels into one reservoir. Here they mingle and blend for a little time in one harmonious whole, so as to equalize any difference of temperature which may have existed prior to their being tapped. Metal is now ladled in small quantities from the reservoir for the purpose of casting testing bars, and a sluice door being opened the molten ocean courses its way down river-like into the centre of the gun mould, which is placed vertically, and muzzle upwards to receive it. Scoria and other impurities float upwards as the metal rises, and great precautions are taken to prevent their flowing with the iron into the "trunnions," which they would weaken, and thus render the whole casting useless. When the metal reaches to within a few inches of the guide shute, the flood-gates through which it flowed are shut for a minute until the shute is removed, and then again opened for the complete filling of the mould. In cooling there is a great subsidence of the metal, especially in the centre, but the hollowness thus produced is in the dead head entirely, and by no means deteriorates the gun. Everything is suffered to remain *in statu quo* for about three days and nights after the pouring operation. The mould is then opened, and the casting, usually perfect, is prepared by lathe and boring mill for proving, and mayhap for battle. Such is some account of the gestation and birth of a great gun, and which, in these non-piping times of war, may be acceptable to the public generally, and certainly must be to the scientific reader.

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*Bonelli's Electric Loom.**

At the meeting of the 7th ult. of the Académie des Sciences, M. de Senazcourt informed the members that M. Froment has completed important improvements in the electric loom invented by Chevalier Bonelli, director of the Sardinian telegraph, which figured at the Paris Exhibition of 1855, and a commission was named to examine it and make a report to the Academy. M. Chevreuil stated that he had been to see it at work, accompanied by the President of the Chamber of Commerce and other gentlemen, and had been astonished at the results obtained. The invention consists chiefly in replacing the Jacquard cards by a thin sheet of tin on which the design to be reproduced on the fabric is figured with varnish or isolating ink. The beat up of the

*From the Lond. Mechanics' Magazine, April, 1859.

batten brings a metallic comb, formed of small separate teeth, into contact with the design, when some of the teeth touch the varnish of the design, and others touch the metal; and those teeth in contact with the metal alone give passage to the electric fluid supplied by a Bunsen pile, and convey it to the small electro-magnets with which they are connected by means of a thin copper wire. These electro-magnets act upon an equal number of small iron rods to keep them out of the way of the wires of the Jacquard, while those teeth which come in contact with the varnish of the pattern are allowed to project against the wires of the Jacquard, to act upon them in the same manner as the cards now used. As a proof of the ease with which new patterns can be applied, when the Emperor and Empress were lately visiting the *Ateliers* to inspect the loom, M. Froment, without interrupting the work, replaced the design in course of execution by a band of tin, on which he had written the words Napoleon III., which were seen to follow on the fabric, the flowers composing the first design.

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*The Oyster Manufacture.**

Although oysters are not exactly spun and woven like cotton, or smelted and rolled like iron, their artificial production has advanced so far as to put the process pretty much in the light of a manufacture. The sowing and breeding of oysters has long been an important branch of our industry; and now the French government has set steadily to work with the matter, on a grand scale, on the coast of France. The place chosen for the experiments in question, is a part of the Bay of St. Brieuc, a spot naturally well situated, and which, for an extent of 12,000 hectares (2½ acres each,) is very favorable for the breeding of oysters, the bottom being shelly sand, slightly mixed with clay or mud. The tide, which there runs from N. W. to S. W., and from S. W. to N. W., at the rate of about three miles an hour, keeps the water constantly renewed, and carries off all unhealthy deposits, and contracts, by breaking against the rocks on the shore, the necessary vivifying properties. The immersion of the breeding oysters was commenced in March and concluded about the end of April, during which time about 3,000,000 of oysters, taken some from the sea and others from the banks at Cancale and Treguler, were distributed in ten longitudinal beds in different parts of the bay, forming together a superficies of 1000 hectares. The position for these banks had been traced out beforehand on a chart, and floating flags were placed to direct the movement of the vessels engaged in the operation. In order that the immersion of the oysters should be made with perfect regularity, and that the female oysters should not be injured by lying too thickly one over the other, two steamers, towing boats laden with oysters, proceeded from one end of the bank marked out to the other, letting down the oysters as they went, and then, when reaching the other end, turning round and retracing their way, thus distributing the fish with as much regularity

* From the Lond. Practical Mechanic's Journal, May, 1859.

as a plough could turn up a furrow in a field. After having laid down the oysters in conditions most favorable for their multiplication, it was necessary to organize around and over them prompt means for collecting the spawn, and constraining it to fix itself on the spot. One of the plans adopted to accomplish this object was to cover the bottom of the new bed with old oyster shells, so that not a single embryo could fall without finding a solid body to fix itself to. The second plan, as already stated in a former report, was to place long lines of boughs of trees, arranged like fascines, from one extremity of each bed to the other. These fascines were ballasted by a weight placed at the bottom, and the tops of them when fixed in their position, stood about eighteen or twenty inches above the bed of oysters, and thus prevented any of the spawn from being carried away by the current. These fascines were placed by men with diving dresses. As the cords with which the fascines were at first fastened would soon wear out, the report states that they may hereafter be replaced by small chains of galvanized iron, manufactured for the purpose in the arsenals of the State. The most exact indications have been made on the chart of the bay, so that the fascines may be taken up as regularly, in order that the oysters attached to them may be collected, as a farmer could pick the fruit from his trees. The report then goes on to say that, although six months have scarcely elapsed since the operations were performed, the result has exceeded the most sanguine expectations. The banks of Cancale and of Granville, in their most prosperous days, never showed such an amount of production. The fascines have on their branches such clumps of oysters that they resemble trees in an orchard, the boughs of which are in the spring hidden by the exuberance of the blossoms. They may be called real petrefactions. One of those fascines, which had been brought to Paris in order that his Majesty might judge of the effect of the plan, had young oysters on it to the number of 20,000. They are already more than an inch in diameter, and they only occupied in the water the space which would be covered by a sheaf of corn in a field. These oysters, when they have arrived at perfection, will be worth at the current price, at least £16. The bay of St. Brieuc will consequently become a really rich treasury, if other beds similar to those already formed be laid down there.

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*How the Earth is Peopled.**

The Director of the Statistical Bureau of Berlin furnishes the following curious statement:—"The population of the whole earth is estimated to be 1,288,000,000, viz:—Europe, 272,000,000; Asia, 755,000,000; Africa, 200,000,000; America, 59,000,000; and Australia, 2,000,000. The population of Europe is thus subdivided:—Russia contains 62,000,000; the Austrian States, 36,398,620; France, 36,039,364; Great Britain and Ireland, 27,488,853; Prussia, 17,089,407; Turkey, 18,740,000; Spain 15,518,000; the Two Sicilies, 8,616,922;

* From the Lond. Practical Mechanic's Journal, May, 1850.

Sweden and Norway, 5,072,820; Sardinia, 4,976,034; Belgium, 4,607,066; Bavaria, 4,547,239; the Netherlands, 3,487,617; Portugal, 3,471,199; the Papal States, 3,100,000; Switzerland, 2,494,500; Denmark, 2,468,648. In Asia, the Chinese Empire contains 400,000,000; the East Indies, 171,000,000; the Indian Archipelago, 80,000,000; Japan, 35,000,000; Hindostan and Asiatic Turkey, each 15,000,000. In America, the United States are computed to contain 23,191,876; Brazil, 7,677,800; Mexico, 7,661,520. In the several nations of the earth there are 335,000,000 of Christians (of whom 170,000,000 are Papists, 89,000,000 Protestants, and 76,000,000 followers of the Greek Church). The number of Jews amounts to 5,000,000; of these 2,890,750 are in Europe, viz:—1,250,000 in European Russia, 853,304 in Austria, 234,248 in Prussia, 192,176 in other parts of Germany, 62,470 in the Netherlands, 33,953 in Italy, 73,995 in France, 36,000 in Great Britain, and 70,000 in Turkey. The followers of various Asiatic religions are estimated at 600,000,000, Mahomedans at 160,000,000, and "Heathens" (the Gentiles proper), at 200,000,000.

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*On the Practical Bearing of the Theory of Electricity in Submarine Telegraphy, the Electrical Difficulties in Long Circuits, and the Conditions requisite in a Cable to insure rapid and certain communication.** By S. Alfred Varley, Assoc. Inst. C. E.

(Continued from page 138.)

There are only two ways of reducing induction, the one is to increase the thickness of the insulating material, and so render the conditions less favorable for its development, and thus approach the conditions of a suspended circuit, where the induction having to take place through a considerable space of air—a dielectric of very low specific inductive capacity—there is but little accumulation of statical charge, and consequently the impetus is almost entirely directed forward, and scarcely diverted laterally to any appreciable extent.

In gutta percha covered wires, when the insulating material is increased in size, it has been shown that the full effect of the increased thickness is not obtained, owing to the outer surface increasing at the same time.

There is also another quality possessed by resinous substances, and probably by gutta percha, worthy of consideration. It is the property of absorbing a charge in the mass of the substance, instead of its being confined entirely to the surface; the tendency of this will be to still further reduce the advantage of an increased thickness of insulating material.

A reference to first principles will make this clearer.

All bodies insulate to a certain extent, and the only difference between a so-called conductor and insulator that would appear to exist, is a difference of degree, and if a charged body is brought into the neighborhood of an insulated conductor, induction will take place

* From the Jour. of the Society of Arts, No. 332.

through it in the same way as through a dielectric, but owing to the particles of conducting substances possessing the property of readily communicating their forces one to another, the inductive force developed at the further extremity will, within certain limits, be scarcely affected by the length of the conductor through which induction is taking place.

The absorption of a charge within the substance of the dielectric is an approach to this condition, but its practical moment when gutta percha is the insulating substance has to be determined by experiment.

Lessening the induction by reducing the resistance has next to be considered.

The first thing obviously will be to obtain a metal of the highest specific conducting power, for could the sectional area be diminished without increasing the resistance, the induction would be reduced proportionately to the decrease in the surface. The next will be to increase the sectional area of the conductor, and although this involves increased surface, yet there will be a gain; for when the diameter of a wire is enlarged, the surface over which the amount of induction extends does not increase in the same ratio as the sectional area which determines the resistance opposed by a conductor. To make this clearer, let four cables arranged side by side be employed as one conductor.

Such an arrangement will possess four times the sectional area, and oppose only one-fourth the resistance; in other words, the same tension of current will force through four times the dynamic quantity of electricity that would be generated through the single cable when used alone. Signals would not, however, be transmitted more rapidly through the four cables than through the one, for although the conducting power has been increased four times, the surface has been quadrupled also, which will exactly counterbalance the lessened resistance; but merge the four into one, the external inductive surface will then be halved, whilst the sectional area will remain the same as before, and there will be only half the induction manifested.

It therefore follows when a wire is enlarged, that as the sectional area increases as the square, whilst the surface increases only in regular proportionals, the relative balance of forces in favor of rapidity of conduction will, in a submarine conductor of a given size, be twice the amount of that in a wire of half the diameter.

I would now attempt an explanation of how it happened that an actual retardation was observed in some of the experiments with the Atlantic cable when a conductor of enlarged sectional area was employed; and on this head I would again quote from my remarks on a former occasion:—

"In the experiments to ascertain whether any advantage would result from the use of an increased sectional area of metallic conductor, recourse was had to joining the cables side by side, the increased inductive surface with such an arrangement involved having possibly been overlooked. This will account not only for an increased speed not having been obtained, but for an actual retardation having been

noticed. Electro-magnetic induction coils do not create electricity, they simply offer a ready means of converting electricity of a low tension and considerable dynamic quantity into electricity of very high tension and small dynamic quantity. The quantity evolved by them is always smaller in proportion as the intensity is greater. Both cannot readily be obtained together, and if a very high intensity is required, the quantity must be sacrificed, unless the size of the apparatus is immensely increased. This difficulty has evidently been appreciated, as the induction coils used by the Atlantic Telegraph Company are of large size and great length, so as to obtain high tension with an appreciable dynamic quantity. Nevertheless, there is little doubt but that the quantity evolved even by these machines, when compared with that generated from voltaic batteries, is small. This being the case, on giving the current a larger number of channels to rush into, there is not enough electricity to fill the wires, consequently the tension of the current will be very much lowered. The effect of this will be that a longer time will elapse before the tension of the wire will be raised sufficiently high at the further extremity to render itself apparent on the instrument. To obtain, under such conditions, the same speed with four cables as would be obtained with one alone, it would be necessary to employ four of these induction coils, ranged side by side, and worked with four times the battery surface, so as to generate four times the dynamic quantity of electricity. When qualified with these conditions, under which, no doubt, the experiments were tried, the reasoning contained in the Atlantic Telegraph Company's pamphlet, given in an earlier portion of this paper, is correct. It is precisely a case of having four Leyden arrangements to charge instead of one. A telegraph cable is, in fact, a Leyden arrangement, which has to be charged to a certain degree of saturation, before signals are obtained. The degree to which it has to be charged, statically, depends upon the extent of inductive surface compared to the conductibility of the metallic core. In a circuit where the conductibility of the metallic core is very great, compared with the inductive surface of the insulating material, no high degree of statical charge can take place, and signals will pass quickly. The opposite effect will be noticed in a circuit where the inductive surface is very large compared with the conductibility of the metallic core. The wire will then have to be statically charged very highly, before a perceptible current will flow from the further extremity, and signals will be obtained proportionately more slowly."*

The reason why signals are found to pass when magneto-electric induced currents are employed in place of voltaic ones arises, I believe, not from any specific difference between them, but simply from the tension of the induced currents being very much greater than any voltaic ones which have been employed.

On this head I will say nothing further here, but would refer those who may take an interest in it to my paper of a former occasion, where I have fully entered into this subject, and also attempted an explanation of how it has happened that in the experiments with voltaic

* *Vide*, "The Atlantic Telegraph."

currents, of varying intensities, no difference of speed has as yet been observed.

The amount of retardation which will be experienced in submarine circuits possessing conductors of varying resistance, and insulated with different thicknesses of insulating material, it appears to me can, comparatively speaking, be readily determined by actual experiment.

I have for a long time been engaged in designing an apparatus for this purpose, and at the time I arranged to give this paper, I fully expected to have had the apparatus completed by this time, and to have been able to have laid it before you on this occasion; and, though I regret not being able to do this, yet I feel I have sufficiently advanced to warrant my explaining the principles of its construction.

The principles upon which it is based are: that a body which offers the same resistance as another, without reference to its substance or length, may, as far as conducting power is concerned, be considered electrically the same. If we make use of a substance or metal of any inferior specific conducting capacity to that of the metal employed in submarine circuits, and also of greatly diminished sectional area, the same resistance as that offered by the very longest circuits can be obtained in a very small compass; and such an arrangement will, as far as simple conducting power is concerned, fairly represent a long submarine circuit.

The induction which manifests itself in submarine circuits can also be obtained if the conditions for its development are as favorable as they are in submarine conductors.

The apparatus consists 1st, of a series of resistances, the values of which are known.

2d, Of a series of induction plates, the values of which, when compared with a given surface of gutta percha coated wire, are also known.

3d, A mechanical arrangement to accurately measure minute periods of time.

By a combination of these resistances and the induction plates, a conductor, which will fairly represent a submarine circuit, will be obtained.

The resistance can be diminished or increased, and the inductive surface can be doubled or halved at pleasure, and thus circuits with conductors of varying lengths and sectional area, and different thicknesses of insulating material, be imitated, and the law which governs the retardation in the transmission of telegraphic signals determined by direct experiment.

It may be argued that as the inductive surface in a telegraphic circuit is uniformly spread throughout, a series of induction plates will not present the same conditions, but it is evident that they may be divided throughout also, and although they will not then precisely represent what is actually the case, the result will approximate very closely to those obtained from a submarine conductor.

Perhaps it would have been prudent not to have called attention to an apparatus before its completion. I have done so, however, because I have felt it was due from me to endeavor, at least, to point out how

some of the important problems involved in submarine telegraphic communications between distant stations may be resolved.

The chief deductions from what has been brought forward in this paper are:—

1st, That the metallic core of a submarine cable should be composed of a conductor of the highest specific conducting capacity.

2d, That a decrease in the retardation which is caused by the induction that takes place in submarine circuits, can only be obtained by increasing the thickness of the insulating material, or by using a wire of larger dimensions; but that it will be better to do this by enlarging the sectional area of the conductor as much as is practicable.

In designing a cable there are many considerations besides those of its simple electrical qualifications which have to be entertained. The object to be obtained is the best result with the most economical investment of money. Are the proportions which were adopted in the Atlantic cable the best to ensure this?

The weight of the conducting coil in this cable is about 93 lbs. to the mile, the value of which, speaking roughly, would, I suppose, be about as many shillings. When served with gutta percha its value was raised to £40 per mile. The iron sheathing and getting the cable on board brought its value up to £100 per mile. The expenditure, however, did not cease here; there were the hire of ships, salaries of staff, &c., &c. In this cable, therefore, only four per cent. at the outside was invested in the conductor upon which the transmission of the messages depended.

If the views which I have brought forward are correct, a conductor of double the diameter would only possess half the amount of retarding force of one of half the size. Such a conductor, at the very outside, would not cost more than £19 per mile, and the increased expenditure, in serving such a conductor with gutta percha, and giving it an iron sheathing, would not, comparatively speaking, be very large; the expenses of the staff and the hire of ships would be about the same in both cases: the latter would be, perhaps, increased slightly, but not to any material amount.

There are a great many other points which should be entertained in such a paper as this, but the paper has already run out to such a length that I will not trespass any further on your patience; and in conclusion I would only add, that if the ventilation of the subject, through the medium of this communication, should tend in any way to the progress of Electric Telegraphy, the object of its author will have been obtained.*

Discussion.—The CHAIRMAN, in inviting the electricians present to take part in the discussion, would call their attention to the generally scientific character of the paper, although there was a passage towards the close of it which opened up a practical question of great import-

*See excerpt minutes of Proceedings of the Institution of Civil Engineers, Vol. xvi., Session 1856-'57.
See "The Atlantic Telegraph. A History of Preliminary Experimental Proceedings, &c., published by order of the Directors of the Company," pages 20, 23, 25, 26, and 40.
See also the *Engineer* of December and January, 1858-'59. "A discussion on the Induction in Submarine Circuits, by X. Y. Z., G. Blair, M. A., Telegraphic Engineer, and J. Tatlock.

ance. Even if this had not been so, he thought in a society like this, where they dealt generally with the practical application of scientific principles, he would have been justified in inviting gentlemen to enter more particularly into the practical application of the theory which had been so ably brought before them. He would call their attention especially to one view which had been expressed very clearly with regard to the difference which existed between the Leyden jar and a long line of insulated wire with a distant termination connected with the earth. Mr. Varley had put before them what insulation practically was in such a case. It was not the separation of a body in an electrical state entirely from all surrounding substances, but the amount of resistance offered by the long wire before it terminated in the earth. This distinction had been brought before them in a very lucid manner, and he thought they were much indebted to Mr. Varley for having done so. He hoped gentlemen present would give their ideas as to the proportion of metallic conductor that should be used in long lengths of submarine cables, such as that between this country and America; also, as to the mode in which the conducting medium should be constructed—whether of a single or a compound wire. This, however, was not the whole question; they had to consider not only the thickness of the wire and insulator, but also whether the insulating substance—gutta percha—was the best that could be adopted for the purpose, and whether before the next great experiment was tried with an Atlantic cable, they could not obtain further light with respect to the insulating medium that was best adapted to a length of cable of that description, both as to cheapness and the power of resisting the pressure of the water, although he thought cheapness in that part of the conductor was a matter of minor importance. It appeared that the conductor itself was only 4 per cent. of the whole cost of the last great experiment to America. The additional cost of the conducting medium, even to the extent of 8 or 10 per cent., was not to be considered for a moment, but the point was, whether by increasing the dimensions of the conducting medium, they did not at the same time increase the amount of induction. He should be glad to hear the views of Mr. Walker on this subject, as that gentleman's experience would be most valuable.

Mr. C. V. WALKER had attended to listen and learn, rather than obtrude his own views upon the meeting, but, being called upon, he would offer a few observations. The difference which Mr. Varley remarked between the Leyden jar and a submarine cable, was that which was generally recognised; it was simply a difference of degree as to the relative states of the inner and outer coating. The cable did practically possess all the distinctive character of the Leyden jar, notwithstanding that the inner and outer coatings were connected, as the experiments made with the Atlantic cable illustrated. The experiments worked out in the early part of the paper to determine the law of induction, would be found very clearly laid down by Sir William Snow Harris in the little book published by Weale. He had shown that the law of induction was inversely as the distance, and directly as the

surface. The next clause of the paper referred to "intensity." This term had led to much confusion; moreover he thought in the present state of electrical science the conditions regarding conduction were far more completely expressed by the formula of Professor Ohm, than by Mr. Varley's diagrams. Another question in connexion with submarine cables was the size of the conducting wires. This was a very important one, and he was quite sure they would think he was possessed of very little modesty if he ventured to give judgment upon a matter which, in his opinion, was so entirely a question of experiment that he only wondered the great cable was laid down before this important point had been satisfactorily investigated, so as to put the matter beyond the possibility of question, whether that conducting strand of seven wires was too large or too small. An opportunity occurred to him to try some experiments with seven or eight distinct miles of insulated wires of different sizes and different thicknesses of gutta percha insulation. The wires were in lengths of about one mile each, and the results of those experiments were decidedly in favor of a small wire as the conducting medium. There were many points in connexion with small wires worthy of consideration, one of which was cheapness, because, although the per centage of saving upon a mile of wire was small, yet the saving would be very great in a cable to extend across the Atlantic. The smaller the wire was the greater the insulating power obtained from the same amount of gutta percha. The alleged advantage of the smaller wire was, that there was a greater resistance in the circuit: but, in the pamphlet published by the Atlantic Telegraph Company, the experiments made by Mr. Reid were described, from which it appeared that he sent a signal through 1000 miles of cable with a battery of two plates only, excited by his tongue, so that the resistance to be overcome by that small battery could not have been great. Another point was the return wire, and upon that he considered the whole question of the Atlantic cable turned. What helped them on the one hand hindered them on the other. The effects of the magnetic disturbances of the earth would be obviated by a return wire. If two lines of cable were laid down, and the current passed to Newfoundland by one wire and returned by the other, this inconvenience would be got rid of, but they would have the other inconveniences which Mr. Varley had laid before them. If the two wires formed portions of the same cable they would cause a greater amount of retardation, because one wire would polarize the other. But if two wires were used in the same cable in a somewhat different fashion, namely, if one was laid as the centre wire, and the other carried spirally round it, and the current divided between the two wires, the polarization would be very much reduced, if not entirely annihilated. Those two wires, however, would act externally upon the outer coating, which would render the advantage nugatory. In his opinion the next Atlantic cable would not be coated with an iron jacket, as the former one had been; but a coating of hemp and other non-conducting materials would be employed. It might be interesting to the meeting to know the time

it actually took to send signals through the Atlantic cable. By Whitehouse's induction coil it took 1¼ seconds, whilst the battery current was 6 seconds in its passage through, at least as far as he recollected.

Professor TYNDALL said that the paper displayed a considerable amount of research, and an extensive acquaintance with the ordinarily accepted laws of electricity, as well as with the phenomena of retardation and induction. He would express the feeling that beset him, as he heard the paper read; and he spoke with all frankness and all respect to Mr. Varley and those who, like him, were engaged in these researches, when he said that knowledge such as had been displayed in this paper, ought to be somewhat like the manure that was applied to agricultural purposes: it ought to be put under ground, and new fruits ought to sprout from it. He had been looking intently for the results of this knowledge which had been brought before them; some of it was interesting, but for the most part, it did not deal with facts, but rather with conjecture, more or less ingenious. The whole subject involved a complicated problem. There was not a shadow of doubt that each element of it could, by proper experiment, be separated from the rest, and its due influence described with certainty; and this was what ought to be done, instead of speculating upon the laws of electricity. He thought those speculations ought to be the private property of the man who worked the subject; they ought to guide him in his searches after facts; and if he produced the facts, he could then show the connection there was between the facts and the first principles of the science. He would refer more particularly to what he should himself like to see done. He had heard remarks about thickening the wire and the surrounding insulation. He would ask had any particular experiments been made to ascertain the law of, or the benefit to be derived from, thickening the wire? Had experiments been made to determine the law by which retardation was diminished, when the thickness of the gutta percha coating was increased? They could take the absolute wires that were to be used, and cover them with gutta percha and india rubber, and compare them, and they could tell with certainty which was the best insulator. They could tell the influence of the thickness of the wire, and the thickness of the insulator; and he thought their knowledge of the principles of electricity ought to be the guiding light to carry their minds to the determination of these cardinal points.

(To be Continued.)

Artificial Wood.

In one of his last lectures at the "*Conservatoire des Arts et Metiers*," M. Payen called the attention of his hearers to the process of making a kind of ebony or artificial wood, very hard, very heavy, and capable of receiving a very high polish and a brilliant varnish. M. Ladry, the inventor of this process, takes very fine saw-dust, mixes it with blood from the slaughter-houses, and submits the resulting paste to a very

heavy pressure obtained by the hydraulic press. If the paste has been enclosed in moulds it will take the form of the mould, and resembles pieces of ebony carved by a skilful hand.

Another curious application of this paste consists in the formation of brushes; the bristles are arranged in the paste while yet soft; the paste is covered by a plate pierced with holes, through which the bristles pass; the pressure is then applied, and brushes are obtained, made of a single piece, cheaper and more lasting than the usual kind. This artificial wood of M. Ladry is much heavier than common woods.—*Cosmos.*

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*Alloy of Steel.**

Experiments have been made at Vienna, Dresden, and other places, in the use of tungsten or wolfram in the alloying of steel, and some extraordinary results are stated to have been achieved. It is said that steel alloyed with 20 per cent. of tungsten produces a mixture, which, while it retains all the general qualities of steel, is so excessively hard that tools made of it will cut, without difficulty, the hardest cast steel. Large quantities of the new alloyed metal are said to be in preparation, and a company is about to be formed to work the discovery.

Uniform Musical Diapason.†

Very considerable inconvenience has long been felt in the musical world in consequence of the want of a uniform standard by which the pitch of musical instruments, whether used individually or in concert, might be regulated. The tendency in all the most celebrated orchestras to an increased elevation of pitch has been attended by evils which affect the interests of music in no small degree. Composers, instrument-makers, and artists are alike sufferers from this cause, and the great difference existing between the pitches (or diapasons, as they are called,) of various countries, or of various musical establishments, is frequently a fertile source of embarrassment in musical transactions. With a view to remedy this acknowledged and growing evil, the French government some time ago appointed a commission of distinguished men to discuss and collect information upon the whole question: and the result of their labors has lately appeared in the *Moniteur*, in the shape of a very elaborate and interesting report.‡

The commission consisted of fourteen members, all of them eminent in the world of music or science, as the following enumeration of their names will show:—Pelletier (Secretary-General in the Ministry of State, President), Halévy, Auber, Berlioz, Despretz (Professor of Physics at the Faculty of Science), Camille Doucet (Ministerial Head of the Theatrical Department), Lissajous (Professor of Physics at the

* From the Lond. Mechanics' Mag., April, 1859. † From the Lond. Jour. of the Soc. of Arts, No. 339.

‡ Rapport présenté à son Excellence le Ministre d'Etat par la Commission chargée d'établir en France un Diapason Musical Uniforme.

Lycée St. Louis, and Member of the Council of the Society for the Encouragement of Works of National Industry), General Mellinet (Superintendent of the Bands of the Army), Meyerbeer, Monnais (Imperial Commissary at the Lyrical Theatre, and at the Conservatoire), Rossini, and Ambroise Thomas. Any opinions emanating from a body of men so well qualified to judge upon a subject of this nature, must necessarily be worthy of attention; and we think, therefore, that a short summary of their report may not be uninteresting to the musical portion of our readers.

The report commences by stating that it is an undoubted fact that the diapason or pitch, has been steadily rising for at least a hundred years, and that it is now quite a whole tone higher than it was in the middle of the last century. As a proof of this, we have the internal evidence of the scores of Gluck, Monsigny, Grétry, and others, besides the more certain testimony of the organs of the time. Rousseau (*Dictionnaire de la Musique*, article *Ton*,) states that the pitch of the opera in his time was lower than that of the chapel, and consequently more than a tone lower than that of the opera of the present day. The first question, then, that naturally presents itself for consideration is, what were the causes which have led to this result? Vocalists cannot fairly be charged with any participation in producing this change. They screamed, it seems, even in those days, without the facilities afforded them by the operas of Signor Verdi. Besides, it is manifestly never for the interest of the singer that the diapason should be forced up—a circumstance which can only tend to increase his fatigue and make inroads upon his voice. The interests, too, of composers are, for many reasons, opposed to an undue elevation of the pitch. They have, moreover, but little power of influencing an orchestra in this respect. The composer does not fix the diapason—he submits to it. It is, then, says the report, to the instrumentalists and the instrument-makers that this result must be attributed. They are the persons who have evidently a joint interest in raising the diapason of the orchestra. Up to a certain point, the more elevated the pitch the greater the brilliancy and sonority of an instrument.

The numerous inventions and improvements which have been effected in wind instruments have more than anything induced the unnatural height which the diapason has now reached. A direct confirmation of this is afforded in a particular instance by a letter addressed to the commission by M. Kittl, the director of the conservatory at Prague, who states that the Emperor Alexander I., upon becoming proprietor of an Austrian regiment, ordered new instruments to be made for the band. The manufacturer, in order to increase the brilliancy of tone, raised the pitch considerably. This having produced the desired effect, the example was followed by other military bands, who all raised their diapason.

With the view of obtaining as much valuable information as possible upon the subject, which is one of universal interest to musical art, the commission wrote to all the most celebrated musical centres in England, Belgium, Holland, Italy, and America. Almost all the answers

which they received agree in their estimation of the importance of the subject, and in deprecating the undue height of the diapasons now in use. Some of these communications, coming as they do from composers and conductors of the first eminence, are very interesting. It would, however, occupy more space than we can afford, to attempt any thing more than a very brief mention of one or two of the most striking. Reissiger writes from Dresden that he hopes all Europe will warmly applaud the establishment of the commission. The great elevation of the pitch, in his opinion, destroys the effect and effaces the character of ancient music—of the master-pieces of Mozart, Gluck, and Beethoven. Ferdinand David, Franz Abt, and Lachner, express with equal decision their approval of the step which the French government has taken. Herr Wieprecht, the director of the military music of Prussia, and Dr. Furke, each forwarded able papers upon the subject, and manifested a lively sympathy with the objects which the commission had in view. From several quarters tuning forks, to the number of twenty-five, were received. Of these Messrs. Broadwood sent three, which afford a striking example of the necessity which exists in our own country for some re-adjustment and assimilation of the pitches now in use. The first is a quarter of a tone lower than that of Paris, and is used exclusively for piano-fortes destined to be employed for the accompaniments at vocal concerts. This, it seems, was the pitch used about thirty years ago by the Philharmonic Society. The second, which is higher than the Paris pitch, is that to which Messrs. Broadwood ordinarily tune their instruments, as being most likely in general to be in tune with harmoniums, flutes, &c. It is the diapason of instrumentalists. The third, still higher, is that now used by the Philharmonic Society, and, with one exception—viz: that employed in the band of the Belgium regiment of guides—is the highest which the commission received. This latter vibrates nine hundred and eleven times in a second, whereas the No. 1 of the Messrs. Broadwood, the lowest of all the tuning forks sent in, gives only eight hundred and sixty-eight vibrations in the same time. This difference is nearly equivalent to a semitone.

With these and various other similar communications before them, the commissioners unanimously came to the conclusion that it was desirable—first, that the diapason should be lowered; and, secondly, that when so lowered, it should be taken as an invariable regulator. The determination of the particular diapason to be adopted naturally presented considerable difficulties, and accordingly led to some diversity of opinion. All agreed that a depression of more than a semitone was neither practicable nor necessary. One member alone advocated a depression of less than a quarter of a tone. He, indeed, proposed that the alteration should at the most extend to half a quarter of a tone—fearing that any greater change, coming suddenly into operation, might act prejudicially upon the trade in musical instruments, which is one of the most successful branches of French industry. It is difficult, however, to see much force in this objection, when we consider the great variety which exists in the diapasons already in use

throughout Europe. In a letter addressed to the Minister of State by the principal French instrument-makers, they enlarge upon the embarrassment resulting "from the continually increasing elevation of the diapason, and from the variety of diapasons," and go on to request his Excellency "to put an end to this kind of anarchy, and to render to the musical world a service as important as that rendered to the industrial world by the creation of a uniform system of measures." It is evident from this that the manufacturers themselves do not regard with apprehension the contemplated change of diapason.

Ultimately, a depression of a quarter of a tone was fixed upon. This, it was thought, would afford an appreciable relief to vocalists; and, "without introducing too great a derangement in established habits, insinuate itself, so to speak, *incognito* into the presence of the public. It would render the execution of the ancient master-pieces more easy; it would lead us back to the diapason employed (in Paris) about thirty years ago—the period of the production of works which have, for the most part, retained their places in the repertory, and which would accordingly be restored to the original condition of their composition and representation. It would also be more likely to be accepted in other countries than the depression of half a tone." In accordance with the recommendations of the commission, an official order has been issued, establishing by law a uniform pitch to be used by all the musical establishments of France which have any connexion with the government. This "normal diapason" is an A, given by a standard tuning-fork to be preserved at the Conservatoire, which vibrates 870 times in a second. All musical establishments authorized by the state must be provided with a tuning-fork, verified and officially stamped as consonant with this standard. These regulations come into force on the 1st of July next for Paris, and on the 1st of December for the departments.

Such are the energetic steps which the French government has taken in a question which, in our own country, would probably be thought far too trivial to call for state interference of any kind. It would, moreover, in all probability, be almost impossible for us to effect any analogous reformation in the musical world by means of official legislation, inasmuch as we have—and we regret that it is so—scarcely any musical establishments which are dependent for their support upon the government, or which can in any way be said to have a national character. Much, however, might be done by private combination. If such men as Professor Bennett, Mr. Costa, Mr. Benedict, Mr. Alfred Mellon, and Messrs. Broadwood could, upon consultation among themselves and with others of our more eminent musicians and instrument-makers, come to some understanding upon this question, and would offer their suggestions to the world, it would not improbably lead to a reform which, as we have before remarked, is even more pressingly called for in our own country than in France, where the movement has originated. It would, at any rate, be satisfactory to know the opinion of the men who, in England, are best qualified to speak authoritatively upon the subject.

*Gun-making at Woolwich Arsenal.**

Of the innumerable experiments tried during the last two years at Woolwich Arsenal for the purpose of ascertaining the best way to make large guns, *one* good thing has come, at all events—the authorities and ourselves know the proper kinds of iron to use for the purpose. Failures there may have been in the subsequent stages of manipulation, but many guns were certainly cast of the best possible admixture of metal for the purpose. So long back as 1856 iron-masters and others were invited by public advertisement to send to that establishment samples of the iron they could confidently recommend for this particular branch of manufacture. Fifty samples came on this invitation. These were subjected to tests chemical and mechanical in the first instance, and selections were made from them. The result of these primary experiments demonstrated what has subsequently been completely confirmed—that English cold blast pig iron is quite equal in purity and strength to the bulk of foreign iron. Northerton and Parkhead were found in these early trials, indeed, to be far superior to East Indian or Nova Scotian. Swedish grey occasionally proved of very superior character, but generally it seemed extremely hard, and it could not be used, therefore, safely in the composition of guns. The impurities sought for in the chemical testing of the iron were silicon, sulphur, and phosphorus, and if these existed in quantities larger than 1·5 per cent. of the first; ·05 of the second; or ·5 of the third, the iron was uniformly registered. The mechanical tests were applied to ascertain the tensile and transverse strength of the material when cast into bars. Its specific gravity was also taken into account. Without going further into detail, however, upon this interesting subject at present, it may be stated—and there is some satisfaction, in a patriotic sense, in doing so—that the irons peculiarly adapted by nature for the manufacture of large guns are English, and these stand in the following order:—Northerton and Parkhead, Staffordshire; Bowling, Yorkshire; and Blaenavon, Shropshire. The cost of these averages from £6 to £6 10s. per ton, against £8 15s. to £10 per ton for foreign. The charge of metal necessary for the casting of a 68-pound gun, with the "dead heads"—the latter is used, however, in the charge for the next gun to be cast—is 8 tons or thereabouts, and the conveniency of using English irons, with the certainty that they are the best, becomes thus apparent. Whether the Arsenal will yet be able to *finish* these weapons in a style equal to that of certain contractors is, we believe, a problem yet to be solved.

Manufacture of Horn by Rolling.†

M. Possoz, of Ixelles, Belgium, has lately suggested the adoption of a combined softening and rolling process for working up horn into various articles and shapes. As a primary treatment, the horn is sub-

* From the Lond. Mechanics' Magazine, April, 1859.
† From the Lond. Practical Mechanics' Magazine, April, 1859.

jected to the action of a hot bath, being kept at a constant temperature by a jet of steam at a pressure of sixty or seventy pounds. In this way, the very heart of the horn is penetrated, and the material is rendered fit for undergoing the rolling or laminating process. When withdrawn from the baths, the pieces of horn are forced on to conical mandrils, for the purpose of straightening them. In this condition the horns remain until sufficiently hardened, when they are taken off the mandrils and split longitudinally into two halves, either by a circular rasp or by a cutter. The horns are again placed in the hot bath for a second softening, and afterwards in a cylindrical wrought iron vessel, formed with a double bottom and filled with oil, into which a jet of steam is introduced. This vessel is worked under a high steam pressure as in the former case, and the horn is now rendered supple and soft and fit for the rolling operation. The "grain" of horn always runs straight, that is to say, the fibres are parallel to each other in the length of the individual horns; and consequently, when rolled, these fibres are all lengthened and compressed, and thus the material preserves its elasticity and solidity. When umbrella and parasol ribs are to be made, this rolling system affords peculiar facilities for the purpose; the whole process, in fact, does for horn what has been so well accomplished for iron.

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*Large Specimens of Titanium.**

At the Manchester Literary and Philosophical Society, Mr. Wm. Brockbank exhibited some large specimens of titanium, which have recently been found in considerable quantities, filling the crevices and under the hearths of the fire-brick linings of the furnaces of the Hematite Iron Company, of Whitehaven. In one instance it occurred in a large mass weighing nearly 4 cwts., under the furnace hearth, having found its way through the crevices between the fire-bricks. Smaller masses, weighing from 50 lbs. or 60 lbs. to a few ounces, were found filling the hollows and crevices in the lining of the furnace, around that part which holds the molten metal. The occurrence of titanium in such large quantities is a new and interesting circumstance, previous instances being confined to a few furnaces in South Wales (where hematite ore is used as a mixture), and to some in the Hartz mountains, in both of which cases the specimens found were comparatively small. Small crystals of it have long been found in the slags of many iron works. Should any commercial use be discovered for titanium, it could be supplied in considerable quantities.

* From the Lond. Mining Journal, No. 1227.

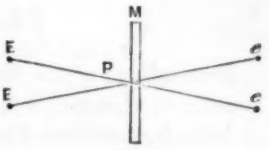
For the Journal of the Franklin Institute.

Experiment in Binocular Vision, elucidating the Principle of the Stereoscope.

A familiar experiment in binocular vision elucidating the principle of the stereoscope, and one which I have never seen alluded to, is

obtained by looking into a mirror and concentrating the ocular axes upon any spot on the surface of the glass, of an equal elevation with the eyes. If no such spot exists it can readily be supplied by wetting a piece of paper or wafer the size of a pea.

The reflected images of the eyes being as far behind the glass as the eyes are before it, and equidistant from each other, the ocular axes concentrated upon the surface of the mirror will, if produced, cross and precisely meet them, producing in the centre of the forehead one large cyclopian eye.



Referring to the figure, let M be a mirror, E E the eyes, *e e* their images, P a piece of paper upon which the eyes are concentrated.

The ocular axes crossing at P, combines the images, *e e*, into one eye, which will appear in the middle of the nose at that point. W.

Germantown, Penna.

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*Expectation of Life at any Age from Five to Sixty Years.**

Every man, woman, and child has a property in Life. What is the value of this property? Mr. Charles M. Willich has established an extremely easy rule for expressing this value—this "*Expectation of Life*" at any age from five to sixty. His formula stands thus: $e = \frac{2}{3}(80 - a)$; or in plain words, the expectation of life is equal to two-thirds of the difference between the age of the party and eighty. Thus, say a man is now twenty years old. Between that age and eighty there are sixty years. Two-thirds of sixty are forty:—and this is the sum of his expectation of life. If a man be now sixty years he will have an expectation of life nearly fourteen years more. By the same rule, a child of five has a lien on life for fifty years. Every one can apply the rule to his own age. Mr. Willich's hypothesis may be as easily remembered as that by De Moivre in the last century, which has now become obsolete, from the greater accuracy of mortality tables. The results obtained by the new law correspond very closely with those from Dr. Farr's English Life Table, constructed with great care from an immense mass of returns.

A Simple Means of Demonstrating the Working of Liquid Fire-shells.†

The bi-sulphide of carbon is first poured into the shell, and then small bits of phosphorus are dropped in; the mouth of the shell is then closed with a cork, partly projecting, like the cork in a wine-bottle. The shell may then be laid on canvass, or other combustible matter; and in about ten minutes, the fermentation of the mixture will force its way through the pores of the cork, and, meeting the

* From the Lond. Athenæum, Feb., 1859.
† From the Lond. Mechanics' Magazine, April, 1859.

oxygen of the atmosphere, will become ignited; the cork acting like the wick of a candle, and the liquor underneath feeding it. A leaden shell thus charged, and adapted to the Lancaster military rifle, will continue to burn for ten minutes with an intense flame which cannot be extinguished by water.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, August 18, 1859.

John C. Cresson, President, in the chair.

John Agnew Vice-President. } Present.
Isaac B. Garrigues, Recording Secretary. }

The minutes of the last meeting were read and approved.

Letters were read from the Royal Society of London; the Commissioners of Public Schools, Baltimore, Maryland; and the American Oriental Society, New Haven, Connecticut.

Donations to the Library were received from the Royal Society, and the Royal Astronomical Society of London; the Smithsonian Institution, and Lieut. M. F. Maury, U. S. Navy, Washington, D. C.; the Regents of the University of the State of New York, Albany, N. Y., and the Mutual Life Insurance Co., City of New York; the American Oriental Society, New Haven, Connecticut; the Maryland Institute, Baltimore, Maryland; Dr. Charles M. Wetherill, Lafayette, Indiana; and from Charles E. Smith, Esq., and J. J. Barclay, Esq., Philada.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement of the receipts and payments for the month of July was read.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (5) were proposed, and the candidates (8) proposed at the last meeting were duly elected.

Two tubes taken from the Pirsson's fresh-water condenser of the steamer *Keystone State*, were laid upon the exhibition table, for the inspection of the members. Six months ago, after a use of several months, many of the original tubes were found to be much injured by the action of sea water; owing to an impure copper having been used in their manufacture. The builders of the *Keystone's* machinery determined to coat the new tube with either zinc or tin, giving zinc the preference, on account of its superior conducting power, though more subject to the chemical action of sea water. However, some of the tubes were coated with tin, and the balance with zinc; and were put into the condenser side by side. The tube heads were of copper, and the external casing of cast iron. A tube of each sort was placed before the meeting. The one coated with tin was perfect as when first put in, with the tin still remaining; whilst that coated with zinc was much corroded, particularly near the ends where it approached the tube heads;

and the heads themselves were eaten away at the places of contact. Thus, the coating of tin seems to be the best preservative of the tubes, and as no falling off of the vacuum took place from the lower conducting power of that metal, another example is brought forth to prove the statements made by Mr. Pirsson in regard to his condenser. (See *Jour. Frank. Inst.*, vol. xxxvi., 3d Series, page 234.)

COMMITTEE ON SCIENCE AND THE ARTS.

Report on J. W. Fawkes' Steam Plough.

The Committee on Science and the Arts constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination "a Steam Plough," invented by J. W. Fawkes, of Christiana, Lancaster Co., Pennsylvania,

REPORT:—That they have examined the machine and witnessed its operation in the field.

The plan of construction appears to be as simple as the case admits. A pair of horizontal engines connected on one shaft by cranks at right angles, propel the machine over the ground, by means of a double gearing, which reduce the velocity of the driving-wheel to one-sixth that of the cranks. The steam cylinders are 9 inches in diameter, and 15 inches length of stroke.

The driving-wheel is a strong drum, six feet in diameter, and six feet long; the large surface of which enables it to run on soft ground. The steering wheels are 3½ feet diameter and 15 inches wide, and are placed 54 inches distant apart.

The axle on which they are placed is guided by a steering wheel geared into a tangent screw.

The ploughs, eight in number, are suspended by chains from a framed outrigger projecting in the rear of the machine, and can be raised entirely out of the ground, by chains working over small barrels, which can at will be connected to the engine by sliding clutches.

The arrangement of the ploughs is such as to allow them to follow in a regular succession at the proper lateral distance for the furrow.

When working at a speed of about three miles an hour, the eight furrows were turned with great ease and completeness. The work was not as smooth as to satisfy a Pennsylvania ploughman, owing to the form of the ploughs, which is such as is said to be preferred for breaking up prairie land, for which this machine is especially designed. It appears to be capable of breaking up land at the rate of three or four acres per hour.

In the opinion of the Committee, its great simplicity of plan and efficiency in working, entitle it to strong commendation, and make it worthy of the Scott's Legacy Medal, the award of which is accordingly recommended.

By order of the Committee,

Philadelphia, August 9, 1859. WM. HAMILTON, *Actuary.*